


Pacific Studies

Special Issue
Sustainability in the
Small Island States of the Pacific

Vol. 22, Nos. 3/4-Sept./Dec. 1999



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PACIFIC STUDIES

A multidisciplinary journal devoted to the study
of the peoples of the Pacific Islands

SEPTEMBER/DECEMBER 1999

Anthropology
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PUBLISHED BY

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BRIGHAM YOUNG UNIVERSITY-HAWAII

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ISSN 0275–3596

ISBN 0–939154–67–6

PACIFIC STUDIES

SUSTAINABILITY IN THE SMALL ISLAND STATES OF THE PACIFIC

Guest Editors

CHARLES J. STEVENS
MIKE EVANS

A Pacific Studies Special Issue
VOL. 22, NOS. 3/4 (SEPT./DEC. 1999) • LĀ'IE, HAWAII

Special Issue

SUSTAINABILITY IN THE SMALL ISLAND STATES
OF THE PACIFIC

CONTENTS

Introduction: Defining and Understanding Sustainability
in Small Island States

CHARLES J. STEVENS

The Sustainable, the Expendable, and the Obsolete

MICHAEL D. LIEBER

Legislating a Sustainable Land Ethic for New Zealand

MICHÈLE D. DOMINY

Accounting for Change: Bringing Interdependence into Defining
Sustainability

KAREN L. NERO

Artisanal Coral Reef Fisheries and Sustainable Development:
The Arno Atoll Fisheries Association

JIM HESS

Is Tonga's MIRAB Economy Sustainable? A View from the Village
and a View Without It

MIKE EVANS

1

13

47

81

109

137

Development, Sustainability, and the Deforestation of Samoa
PAUL SHANKMAN 167

*Taking Over What Belongs to God: The Historical Ecology of Tonga
since European Contact*
CHARLES J. STEVENS 189

Contributors..... 221

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OF THE PACIFIC

Volume 22, Numbers 3/4

September/December 1999

INTRODUCTION: DEFINING AND UNDERSTANDING SUSTAINABILITY IN SMALL ISLAND STATES

Charles J. Stevens
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THE ARTICLES IN THIS VOLUME represent the culmination of a protracted discourse that started with an informal session titled "Sustaining Islanders: The Political Ecology of Small Island States" at the Association for Social Anthropology in Oceania (ASAO) meetings in 1994. The idea for the session began with a discussion between Mike Evans and me a couple of years earlier. While we both worked in Tonga, Evans's research interests focused on kin-based systems of gift giving and socioeconomic relations founded in exchange. My own interests were in understanding changing systems of agroecology and the economic strategies of smallholder agriculturalists in Tonga who managed an internationally distributed array of resources in agricultural and nonagricultural labor and production. From my perspective agriculture, smallholder management, and chiefly administration in Tonga had provided a reasonably unambiguous demonstration of a process that had remained stable, productive, and resilient for several thousand years but less so since World War II. Evans had witnessed the strength and durability of a kin system whose members were in Ha'apai, Tongatapu, Pago Pago, Suva, Auckland, Sydney, and along the North American Pacific coast from Los Angeles to Vancouver and inland to Salt Lake City. For both of us, though in different ways, our work revolved around the somewhat fuzzy concept of sustainability. As co-organizer of the session, I had the relatively unostentatious expectation of getting together a number of anthropologists with interests in the intersection of political economics and cultural ecology in the islands of the Pacific Ocean. As the session came together, it became clear

that a discussion of the social, economic, ecological, and cultural dimensions of “sustainability,” as the process of maintaining what is valued for a long time, was inevitable and necessary.

Despite the complexity of the relationships among cultivar biodiversity, labor-intensive resource management, stability of production, unpredictable market forces, and peasant risk-minimizing strategies, agriculture presents a reasonably clear construct of “sustainability.” The ecological and productive utility of multicropping, intercropping, agrobiodiversity, and maintaining soil structure and fertility through labor-intensive use of local resources have become increasingly well understood and offer a stark contrast to the industrial agriculture of the West, which is dependent on nonrenewable and finite reserves of petroleum and is known to be the single largest source of non-point-specific pollution on the planet (Gleissman 1998). Sustainability, I thought, was seemingly well understood in agroecology circles and would be similarly understood elsewhere. Perhaps the term could be unambiguously applied to fisheries and forests in Samoa, Arno, Tonga, and Kapingamarangi, and from shepherds in New Zealand to development projects and government policies in the Federated States of Micronesia. In various ecological settings and in a host of political-economic contexts, production systems were either likely to last for a long time or not.

The first question raised in our initial informal meeting was “What do we mean by the term ‘sustaining’ in the title of our session?” Sustaining what, for whom, by whom, in what political economic context, and for how long? Ecological economists had defined sustainable as “the amount of consumption that can be continued indefinitely without degrading capital stocks—including ‘natural capital’ stocks” (Costanza, Daly, and Bartholomew 1991:8). Anthropologists were fidgety and uncomfortable in the presence of such unquestioned neoliberal concerns with (however implied) concepts of maximized consumption and simple cost-benefit analysis. Our collective attention turned to the disparity between the rhetoric of sustainable development articulated in government policy and what indigenous Pacific people were actually doing with regard to management of cultural and environmental resources. Since “sustainability” in the Western nations arises primarily from concerns about environmental degradation and the development of environmental ethics, how were we to discuss this issue in the context of Pacific people who, despite having practiced agroforestry, husbandry, and gathering of marine resources for thousands of years, exhibited no clear indigenous conservation ethic (Olson 1993; see also the Shankman and Stevens articles in this volume)? Yet, clearly something was being sustained.

We posted our concerns to the ASAO electronic discussion list, and there followed a several-months-long discussion about sustainability and the utility

of the term for anthropologists' involvement with Pacific Islands peoples. One aspect of sustainability became clear: if the productive capabilities of the Pacific people were maintained and appeared for some period of time to be stable and resilient, it is because knowledgeable human actors made it so. Sustainability was a characteristic of anthropogenesis, and human agents acted on their own ideas about what was to be sustained and how. The manner in which a productive system is maintained by actors on an ecological landscape implies certain needs and requirements of the social system. In agriculture, complex agroforestry systems in the Pacific sustain soil fertility and agrobiodiversity and ensure long-term productive yields, and, conversely, maximizing market-crop production, removing trees, and purchasing fertilizers quickly provides needed currency to smallholder households. Both serve to "sustain" existing relations of production. Tropical island ecosystems separate from human actors have no teleological motivations for maintaining stability or fostering change. The farmers and fishers who manage ecological systems, however, determine resource utility, and people's changing needs become manifest in the condition of the environment. Our concern in the organization of the symposium and in the essays in this volume that came out of it was to document both changing human-resource interactions in Micronesia and Melanesia, and the political-economic and cultural influences on farmers' and fishers' resource management activities. This concern reflects our collective conclusion that it is "in the mix" that sustainability lies.

Concepts of Sustainability

Sustainability is a relationship between dynamic human economic systems and larger dynamic, but normally slower-changing ecological systems, in which 1) human life can continue indefinitely, 2) human individuals can flourish, and 3) human cultures can develop; but in which effects of human activities remain within bounds, so as not to destroy the diversity, complexity, and function of the ecological life support system. (Costanza, Daly, and Bartholomew 1991:2–3)

The term "sustainability" was apparently first used as a criticism of industrialization in *The Ecologist* magazine's *Blueprint for Survival*, published in 1972. This was at a time when the canons of modernism were first being subjected to serious scholarly criticism in dependency theory proposed by Andre Gundar Frank (1966), in *The Limits to Growth* computer-simulation report by Meadows and Meadows (1972) of the Massachusetts Institute of Technology, by the subsequent reports of the Club of Rome, and by philosophical postmodernists like Capra (1983). Interest in issues of sustainability,

as lasting and stable economic systems, derives from a theoretical political ecology concerned with designing future modes of production that do not degrade the natural ecosystem. This concern is based, in part, on reflection on the political economic events of the nineteenth and twentieth centuries and the realization that whatever benefits modernization may have brought to the world's human population, these do not include lessons in effectual stewardship of limited resources and their equitable distribution. The philosophical roots of concerns with sustainability are postmodern, or at least anti-modern, but the analytical tools of most scholars interested in the issue have not reflected wholesale rejection of the exacting, pragmatic, or rigorously empirical methods of Eurocentric scientific inquiry. However, questioning the superiority of the modern over the premodern and doubting the validity of rigid disciplinary boundaries between the natural sciences, the social sciences, and the arts is part of the analytical perspective accepted by agroecologists (Altieri 1987; Gleissman 1989; Nair 1989), agronomists (Thurston 1992; Hoekstra and Kuguru 1983), geographers (Bayliss-Smith 1982; Clarke and Thaman 1993), biologists (Huston 1979; MacArthur and Wilson 1967; Wilson 1992; Reice 1994; and see Worster 1990), and policy consultants (National Research Council 1989).

The term "sustainability," as Netting has noted, "is a prime candidate to be the watchword of the 1990's" (1993:143); indeed the notion, however variously defined, has reached a point of substantial popularity in "green" and, in contrast, economic development circles. Most of the definitions of the term include ecological as well as economic and social connotations (Barbier 1987:104). The various definitions accent environmental restrictions, economic dimensions, and social characteristics of resource distribution and place those parameters in "contexts of changing interactions" (Netting 1993: 143): the latter referring to the historical process of changing relations between humans and their environment, and between humans and their spheres of social and economic relations. Smallholder agriculturalists and fishers have frequently been portrayed as managing resources under environmental restrictions, operating in complex economic and political contexts, and practicing stable systems of reciprocal obligation in resource distribution.

So, agricultural sustainability, as a part of economic sustainability, could be relatively unambiguously measured and defined as the ability of the agricultural system to maintain productive social relations in the face of climatic perturbations and political stresses without permanent environmental degradation. Thus, sustainability is seen as a function of the environmental aspects of the system, the nature of the stresses on the system causing change, and the individual and societal enterprise necessary to counter the stresses imposed on it (Stevens 1996:101). Netting (1993) focuses on the smallholder farmer where a variety of on- and off-farm strategies and the family farm's

intergenerational and familial focus lead to resource conservation practices and a decreased concern for short-term profit maximization at the cost of resource degradation. He presents convincing evidence that smallholder agriculture, practiced by an overwhelming proportion of the world's farmers (Netting 1989:221), can maintain impressive yields per unit of land without degrading the resource base on which continued production depends. He states that "the success of smallholder cultivation is not only its large and dependable production but its ecological continuity and conservation, its *sustainability*, in the currently popular phrase" (ibid.:224; italics in original).

Historically, sustainability was not thought to have been characteristic of most indigenous economic systems in the face of European expansion, although such systems are presumed to have been sustainable before capitalist penetration (Klee 1980). This assumption may be more a matter of romanticized notions of indigenous human-land relations than the actual case, as the ecological archaeology of the Pacific indicates (Kirch 1982; Steadman 1995; Kirch and Hunt 1997). What is certain, however, is that modern human-land relationships characteristic of industrial agriculture consume resources at far greater rates than the natural capacity for replenishment and, measured in kilocalories, return very poor production per unit of energy input (Ellis 1987; National Research Council 1989). Equally certain is that many pre-European resource management strategies in the Pacific were sustained for several thousands of years despite the ecological consequences of the initial colonization of islands and returned very large yields per unit of land (Clarke and Thaman 1993; Stevens 1996). Even without a conservation ethic, relative sustainability of the landscape and seascape was apparent.

Indigenous farmers, even on small Pacific islands, developed agricultural systems whose productive capabilities belied the fragility of the environment. Social organizing principles—social hierarchies and chiefdoms—may well have been established to minimize social causes of disruption and to mobilize efforts rapidly to rectify the destructive consequences of unpredicted natural perturbations. As well, a host of risk-minimizing agronomic practices were designed not to control the production and distribution of resources during average years, but to mitigate the disruptive effects of occasional, unpredictable environmental perturbations. To the extent that natural ecosystems are in states of continuous chaotic activity, it was the role of indigenous farmers to impose stability of production onto a chaotic nature.

The design of kin-based distributive networks, the invention of food-storage techniques, and the land management practices of, for example, Tongan farmers (see Stevens 1996) and New Zealand shepherds (see Dominy, this volume) ensured high yields of crops or of fleece, and the effects of storms and occasional droughts were insufficient to disrupt production over the long

haul. The authority of chiefs in traditional Polynesia (Sahlins 1958; Kirch 1984) and the distribution of power and control along family lines and through competent chiefly administration ensured sociocultural resilience to times of ecosystem and productive stress. These practices provided farmers some assurance of making it through times of shortage caused apparently not as much by the inherent limitations of their environment as by the effects of minimally predictable environmental perturbations.

At any level of analysis higher than the farm, however, sustainability is difficult to define. Central in these definitional problems is the resolution of perceived discrepancies between economic and ecological perspectives regarding the role of markets and of social institutions in system sustainability. Neoclassical economists are committed to a model in which continued population growth, resource constraints, and insatiable human needs lead to improved market production and, in a linear fashion, to increased labor specialization and increased interdependency between individualized consumers and producers. In this view, development of "sustainable markets" necessarily involves continued allocation of resources to the maintenance and perpetuation of commodity production. In a context of limited resources, such a proposition is untenable.

Scholarly concern with the economic dimension of sustainability has prompted the formation of the new "transdisciplinary field of study" of ecological economics (Costanza, Daly, and Bartholomew 1991). Ecological economics differs from conventional economics in its realization of the disastrous, long-term consequences of "decisions made on the basis of local, narrow, short-term criteria." It addresses the relationship between ecological systems and economic systems by using the tools available from both of these disciplines and from other disciplines (such as medicine) for a thorough understanding of environment-economy interactions. A great deal of the stimulus for ecological economics has come from the work of Herman Daly and John Cobb (1989), who suggest the need for a paradigm shift in economics questioning some of the fundamental assumptions of neoclassical economics.

Daly and Cobb argue against many of the most basic assumptions of economists and note that "the market is not the end of society and is not the right instrument through which the ends of society should be set" (1989:14). They support decentralization of political and economic power but favor private ownership of the means of production when private ownership is not concentrated in a few hands. While criticizing the centrality of individualism in classical economics, they remain convinced of the soundness of market principles and seek to expand the classical economic paradigm to include the larger ecological contexts in which it operates. Ecological economics, however, offers little distinction between development and growth in terms of either how development, as opposed to growth, necessarily entails restricted use of

limited natural resources. There is no recourse to truly alternative or creative economic system description and development in the ecological-economic camp other than a slight modification of neoclassical economic practices. Indeed, for all of the well-considered criticisms of contemporary economic activity by ecological economists, such as their criticisms of doctrines justifying externalization of costs, defining myopic concepts of valuation, or discounting investments in the future, the constructs of ecological economics and its definitions of sustainability are thoroughly steeped in the ideology of neoclassical economics.

Costanza, Daly, and Bartholomew, for example, note that “conventional economic and ecological models and concepts fall far short in their ability to deal with global ecological problems” (1991:2), but they define alternative and sustainable economics entirely in neoclassical terms, stating that sustainability is the “amount of consumption that can be sustained indefinitely without degrading capital stocks—including ‘natural capital’ stocks” (ibid.:8). This approach ignores the many examples of more-sustainable human economic behavior, historically and in the “modern” era, that are non-Western in origin and provide evidence of economic systems not based on ideologies of progress, pure economic rationality, or maximized consumption. Many of these examples come from anthropological portrayals of practically reasoned economics where notions of rationality as mere maximized utility do little to explain either human-resource interactions or human social relations.

Sustaining Islanders

What can anthropologists studying Micronesian and Polynesian peoples contribute to the discourse of sustainability? Can we add conceptual or methodological insights that will demonstrate the ineffectiveness of contemporary development paradigms, now couched in terms of “sustainable economics,” or point toward new approaches to improving Pacific Islander livelihood and maintenance of their cultural affinities? As the participants met in sessions at the Association for Social Anthropology in Oceania meetings from 1994 to 1998, we began to center our attention on the common threads that connected our diverse papers. That common thread was found by focusing on the nature of Pacific Islander constructions of the environment as a template for preservation of family relations. We noted that the dichotomy of “nature” and “culture” was not particularly characteristic of the ideology of production that informed Polynesian and Micronesian economics centered on sustaining the ecology of social relations. Land and sea were resources for supporting the primacy of family and maintaining corporate kin ties whose preservation meant survival in times of scarcity and pleasure in times of plenty. The terrestrial environment of islands, particularly, was socially constructed

by islanders from the moment of initial colonization. Sustaining kin relations did not translate into “sustainable production” as defined by Western (or Northern) concepts of economic efficiency and environmental maintenance, although that “template” was found in all of the Pacific Islands states’ national development plans and South Pacific Commission environmental assessments.

Political-economic change brought maximizing technologies and maximizing ideologies that were adopted by Pacific Islanders to meet kin-based, social, and church-mandated obligations. Competitive feasting and church donations were enhanced by the presence of outboard motors and nylon nets for improved fishing, chainsaws for land clearing, labor out-migration for access to funds, and John Deere tractors for tillage and land preparation. These changes came rapidly, and the ecological and social consequences of their adoption came later in the form of eroding soil fertility, deforestation, and changed relations of production—costs absent from development bank ledgers but prominent in islander well-being.

Paul Shankman noted in our discussions that Pacific Islanders were communal people with communal ideologies whose productive activities were for communal purposes organized under communal control. The conceptual and productive constraints that accompanied these communal ideologies and controls resulted in sustained relations, sustained production, and sustained capacity for production. The Tongan farmers with whom I worked understood immediately my research interests in sustainability (*poupou mo fakatolonga*) of agroforestry production, but many farmers remained largely unconcerned with decreasing soil fertility and saw no relevance in loss of biodiversity. The possible consequences of tractor tillage, pesticide application, and market-crop production, which some farmers understood, were insignificant compared to the consequences of unmet family obligations, and failing in one’s *fatongia* (duty) was far more serious than environmental disruption. Sustainability, then, is a set of relationships between the environment and the producers, among producers themselves enmeshed in a cultural milieu that prescribes economic activity, and encompassing political-economic changes that directly alter human-resource relations. If one aspect of the relationship is privileged in the context of changed productive capabilities, another set of relationships suffers. In the Pacific, family and kin relations are privileged, maximizing technologies are accepted because they foster meeting those obligations, and the environmental bases of production may suffer.

The history of the changes in these sets of relationships is a common factor in all the articles presented here. These relationships between environment and technology, environment and culturally prescribed economic activity, and external forces of production and internal means of production are nowhere better illustrated than in Michael Lieber’s systems view of sustainability focusing on the analysis of activities of Kapingamarangi fishermen.

Fishing practices on Kapingamarangi Atoll were once organized through the men's house, based on compliance with an external order of gods who controlled specific areas radiating out from the atoll. Communal labor was hierarchically organized and production practices based on relatively predictable variation in wind and surface conditions, while priests served as liaisons between the unpredictable spirits and the Kapinga fishermen. Change at the social level as a consequence of new external orders brought by Japanese and American administrations rendered previously sustained social relations and fishing technologies obsolete and therefore unsustainable.

Such complexities are seldom considered when policy decisions, all expressing concerns with "sustainable development" or "sustainable relations," are made by "top-down" development planners. Karen Nero's analysis of the Marshall Islands demonstrates that the utility of the term "sustainability" depends on understanding its definition at local, national, and international levels. Perspectives based on dichotomized notions of economy, subsistence and market, traditional and modern, fail to recognize the plurality of philosophically and practically antithetical economic systems in the Marshall Islands: the Marshallese chiefly and extended family redistributive economy, the governmental redistributive economy (involving subsidized public services), and a Western user-pays economy. Similarly, Jim Hess presents three accounts of the sustainability of a fishing development project in Arno, Marshall Islands. His first account of the fishing market development project focuses on monetary costs and benefits, and determines that, at this level of analysis, the project is unsustainable. At the level of international relations, the Arno Atoll Fisheries Association project serves to sustain existing unequal relations of power and dependency. Finally, Hess suggests that assessments of success or failure must be historical and consider the costs of lost knowledge and imposition of new knowledge and values.

Michèle Dominy explores different, competing discourses of sustainability and the emergence of a land ethic in New Zealand's South Island high country. Here a long history of competing interests and changing concepts of land, culture, identity, and nation prevent facile and simplistically catholic concepts of sustainability. Dominy records the historical contestation of the idea of sustainability and what is sustainable as environment, community, and identity, demonstrating that there is a fight for proprietary ownership of ideas as well as landscape. Whereas emotional ties to the land define what has value and is, therefore, to be sustained in a particular way in New Zealand's high country, Evans shows that the family is what is valued and sustained by Tonga's transnational system of emotional ties. The Tongan and Samoan kin-based system of resource distribution fosters deep feelings of obligation and reciprocity that inform the exchange of material goods as emotional markers of kinship and community. Evans asserts that what is sustain-

able in Tonga's contemporary political economy is the now transnational system of emotional and monetary ties that expand Tonga's limited productive capabilities. Governmental decisions to limit these ties are important, but the determination and motivation of islanders to maintain these emotional ties are more significant predictors of sustainable relations.

Shankman's and Stevens's articles present historical ecological discussions demonstrating the loss of previously sustained environmental resources. Shankman presents a history of the deforestation of Samoa contextualized in changing ideas about development and sustainability. While early hopes for Samoa's economic development centered on its agricultural potential, later efforts were geared toward extraction of Samoa's valuable tropical timber. Local and customary ownership of forest resources slowed development in this arena and contributed to rendering early corporate investment in timber extraction unprofitable. In the latter part of the century, after foreign foresters had departed, deforestation became the consequence of privatization of the once communally held forests. Stevens portrays similar loss of ecological resources in the recent changes to Tonga's highly productive agroforestry system. Again, the primary actors are Tongan smallholders sustaining relations among related households and among households, the church, and the state, but they have been enticed into the global market by Japanese business enterprises and regional and governmental development goals. The slow-to-develop ecological consequences of tractor tillage and the use of petroleum-based inputs lag far behind the immediate economic benefits of market-crop production and the significance of sustaining social ties.

All of the articles here take the common assumption of the anthropological approach, that is, that humans have agency (or at least behave as if they do). The human-ecological nexus is more complex than ecology or economics alone, and thus so too is anything one might call sustainability. Some concept of value lies at the heart of human action, and for anthropologists generally and in the view of the authors of the articles in this volume, if the notion of sustainability is to have value, we must start with the exploration of human activity as a value-laden process of sometimes sustainable result.

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THE SUSTAINABLE, THE EXPENDABLE, AND THE OBSOLETE

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This is a preliminary exploration of the concept of sustainability and its potential usefulness to anthropologists. “Sustainable” is distinguished from “stable” and “viable” in terms of its implications of directionality of time, pointing both backward and forward. Given the time implications, the contexts of “sustainable Xs” (technology, activity, development, etc.) are crucial to explaining what happened to X in the past and prognosticating its future. The argument is illustrated by analyzing data on obsolete fishing practices on Kapingamarangi Atoll (Federated States of Micronesia), focusing on the contexts of change in political/religious organization in the twentieth century. Changing access to both new and old technology render many traditional fishing practices obsolete through replacement by new techniques and by neglect. The relationship between the obsolescence and the sustainability of fishing techniques changes over time, the change constrained by the Kapingamarangi concept of “knowing” and by fishermen’s dependence on technology requiring cash outlay. Sustainability in this analysis is a concept most appropriate to the emerging field of political ecology.

THIS IS AN EXPLORATION of the construct of sustainability to answer the question of how useful it might be to anthropologists. “Sustainability” has become a buzzword in the social sciences and in fields such as urban planning, economic and commercial development, public-health programs, and among public and private funders. Foundations considering proposals for interventions in these areas demand to know how a proposed intervention will be “sustainable” after the funding period. There is already a rapidly growing literature on this subject, and there is variability in the ways that scholars in different fields understand and use the concept. I do not question their judgments or research agendas but merely pose a set of questions

that anthropologists would ask given our own sorts of research agendas. My naïveté on this subject may be evident, yet I have found that there is a lot to be learned from naïve questions. So if my approach seems elementary, it is because the utility of a new research construct is always measured both by the new sorts of questions to which it leads and by how it fits with constructs and logic that researchers know to work in the field situations in which we find ourselves.

“Sustainable X” (technology, policy, community, and so forth) is a very appealing term. Like other fortuitous concepts, its core meaning initially serves to connote more than to denote. What sustainability connotes is an arena of inquiry. If sustainability starts out as vague and contentless, then its usefulness depends on how one fills in its denotata. “Filling in” is common in scientific discourse, as the histories of “atom,” “gene,” “intelligence,” and “culture” amply demonstrate.

Sustainability is neither a thing nor a process. Sustainability (or sustainable X) refers to an outcome of one or more processes such that some X is observed to be continuously present over some period of time. Practically, X is sustainable if some observer’s description of it at time₂, time₃ . . . time_z is more or less the same as the description of it at time₁. In normal usage, it is the size of the population in its environment that is continuous. A sustainable technology (or development, policy, and so on) is commonly understood to denote one that allows for maintenance of a population at a constant, if not expanding, size.

If this construal is acceptable, then is describing X as sustainable saying anything more than that X is stable? Are “stable” and “sustainable” synonyms? Kind of. Both refer to temporal continuity of some state for long enough to dismiss “temporary” as a reasonable description. While their denotations overlap, their connotations do not. Stability has a “present time” synchrony about it in the way it is used: “Is this a stable system? His condition is stable. They are trying to destabilize X.” These sorts of usages—and usages count—imply something on the order of stability as the expected outcome of the nature of X, as somehow built into X and, therefore, timeless or at least asynchronous in its manifestation.

Sustainability, in contrast, connotes diachrony. Used in prognosticating an outcome of some planned program of change, it points forward in time. Used to describe the current state of some X, it points backward in time. Either way sustainability seems to imply some temporal sequence of events that begins with an innovation resulting in a new order of stability or, conversely, a relatively permanent instability. In the former case, we describe X as sustainable, in the latter case as unsustainable.

The sustainability of X might imply that X is somehow self-sustaining.

That is, X is either preadapted to its environmental and social contexts or it is adaptable to those contexts with appropriate modifications. In either case, the implication is that X somehow *fits* with a community's customary activities or that the changes in activities necessitated by adopting X are coordinated well enough to preclude disrupting the internal functioning of the community or causing environmental damage that threatens the population's existence. "Fit," like sustainability, is appealing and tricky—it is shorthand for "compatible with," a descriptive summary of ethnographic evidence. Like sustainability, "fit" also points in two directions: (1) to a community's ordering of social relationships and to an ordering between the community and higher-level authoritative relations that contextualize X and (2) to the ordering of human relations with the nonhuman environment. Both the political-economic relations of the community with other communities and with higher-level authority (if any) and the environmental conditions to which people ordinarily respond contextualize the community and, thus, contextualize X.

So, for example, a new item of technology might be compatible with some or all other items in the community's technological assemblage. Or it may make some items in the assemblage obsolete. Or it might be incompatible with some or all of a community's technology. It might fit with a community's technology but disrupt relations of group organization and authority, as, for example, Sharpe's description of missionaries introducing steel axes to Australian aboriginal populations through women (Sharp 1952). Or it may be a useful, adaptable technology for 10 percent of the population but not for the other 90 percent. If this ratio replicates the way items are normally distributed in a population, for example, with one class of people getting the new item to the exclusion of others, then fit is assured (unless those introducing X intended it to be distributed equally, in which case the introducers have not done their homework). X may be so efficient that its use by more than 10 percent of the population leads to resource overexploitation and environmental degradation, making it incompatible with the environmental context. A technological change might be sustainable in one community while disrupting its relationships with another community with which it practiced regular exchanges. Pomponio (1993) describes this sort of situation in the Siassi Islands, where the livelihood of Mandok Islanders, traditional middlemen in exchanges throughout the island group, was threatened when their partners began cash cropping and importing Western goods.

These examples indicate that the sustainability of any X is an outcome of systemic processes that link people to one another within a community, to their natural environment, and to other communities. Sustainability is a systems construct or it is nothing. Common to different versions of system

theory is the idea of a system as the coordinated relationships among interacting components inside a boundary, these relations serving to process inputs from an environment and to transform them into outputs to the environment—all in relation to some observer (Hall and Fagen 1968:81–92). A system's internal states change over time according to the kind and intensity of its inputs corresponding to changes in the states of the environment (see Ashby 1956:202–218). To the extent that the interactions among components serve to regulate the interaction between the system and its environment, we can describe the system as both adaptive and self-regulating. So, say that some X, whether introduced from the environment as a new input or generated from within the system by an internal change (see Barnett 1983 for examples), serves to change one or more of the system's components or their relations so that the system achieves new states. The sustainability of X depends on the extent to which the changed system can regulate its internal relations to achieve a new steady state in relation to its environment. The X initiating the change is sustainable if and only if the system continues to be adapted to its environment.

Taking X as technology, what does “sustainable technology” mean? What is it that is sustained: the technology? the population? the environment? From a systems perspective, what is sustainable or unsustainable is a particular kind of relationship between a population and its environment. This relationship is shaped by the hardware; by its techniques of fabrication, acquisition, and use; by the social organization regulating access to the hardware and techniques; and by the features of the environment to which they are applied. One can examine the components of this relationship and see how they cohere. One can ask, for example, whether a particular social organization can support a particular technology. Or, one can ask what the minimal social organizational requirements for a particular technology are or which environmental relationships change with the adoption of a particular technology. For example, the adoption of metal fishhooks on Kapingamarangi Atoll in Micronesia resulted in reduced pressure on several species of mollusks and fish (e.g., filefish) formerly used for hooks, cutting tools, and abrasives.

Focusing on the kind of relationships between the population and its environment that result from a particular technology, one can say that a sustainable technology is an outcome of the persistence of that relationship. This view of the matter casts doubt on the reliability of population size as an indicator of a sustainable technology. Population size may be an outcome of any number of factors having little to do with technology. As demonstrated below, population size can vary dramatically with no change in the population-environment relationship.

With these systemic considerations in mind, I turn to a specific case to examine the utility of this approach to sustainability. The ethnography of fishing practices on Kapingamarangi Atoll, a Polynesian community in Micronesia, affords a useful test of the systems view of sustainability for five reasons.

1. It is a longitudinal ethnographic study beginning with the Thilenius expedition in 1910 (Eilers 1934), followed by research in 1947 by Kenneth Emory (1965), Peter Buck (1950), and Samuel Elbert. A team of environmental scientists worked on Kapingamarangi in 1954 (McKee 1957; Niering 1956; Wiens 1956, 1962). My own field research began in 1965 and has continued through five field stays to 1990 (Lieber 1994). Ethnohistorical work extends our data back to about 1780.
2. The acquisition of materials for and fabrication of traditional fishing hardware are documented in superb detail by Peter Buck (1950), supplemented by the organization of the techniques of its use and the social organization of its application to specific locales in the atoll environment (Lieber 1994).
3. Changes in fishing technology have been documented from precolonial to colonial through the most recent times—all in the context of how fishing is organized.
4. A systems framework guided the design of the data collection on fishing activity on the atoll (Lieber 1994:19–39). By using the activity as the unit of analysis, data collection focused on the processing aspect of the population-environment relationship so that features of each activity (e.g., goals, procedures, personnel, social organization, equipment, and occasions for an expedition to net spinefish on the reef) are immediately generalizable as constraints shaping the activity. This generalization enables comparison of constraints and the organization of constraints across different fishing activities, making their systematic nature transparent (*ibid.*:113–127).¹
5. Data on fishing activities and their organization are without exception Kapingamarangi fishermen's own accounts of their work. Thus, empirical generalizations about its systemic organization follow from the ways that Kapinga fishermen represent what they do, how they do it, and why they do it that way.

Kapingamarangi Fishing Activity: The Lesson of Obsolescence

Kapingamarangi Atoll is fifty miles north of the equator, lying northeast of New Guinea and 485 miles southwest of Pohnpei Island, the capital of the

Federated States of Micronesia, of which the atoll is part. Before colonial contact in 1877, Kapingamarangi was one of the more isolated atolls in Oceania. The atoll's half a square mile of land area supports a population of 450 people, who make a living cultivating taro, breadfruit, coconuts, and pandanus, the only food plants native to the island. Protein comes from the reef, lagoon, and deep sea. By 1900 Kapingamarangi (hereafter Kapinga) fishermen had a repertoire of eighty-five different, named catch techniques. These techniques were variations of seven major methods—netting, angling, pole and line, trapping, use of weirs, collecting on the reef, and diving (for clams).

The Organizational Context of Traditional Fishing Activity

Before conversion to Christianity, Kapinga fishing activity was organized to respond to two sorts of environmental conditions: (1) predictable variations in winds and associated water surface conditions and tides, and (2) the much less predictable activity of spirits, six of whom inhabited the deep sea, while others moved between the island and the horizon.

Several constraints shaped the choice of netting methods. Most important are seasonal wind and tide patterns and variations in tide patterns through a lunar month. During the windy season, from October through early April, the lagoon is choppy, making canoe travel impossible, and there is one low tide per day, usually in the evening or at night. Fishermen had to rely on angling in the lee of the wind beyond the reef, on pole and line fishing between the channels and on the seaward shores of the islets, and on group netting on reef flats. During the calm season, the lagoon is navigable, and there are two high tides and two low tides per day. Every technique in the Kapinga repertoire was available. During a lunar month in any season, the rapidity of fill and ebb, how long the tide stays low or high, and how high or low the tide gets varies regularly through three-day periods from the new moon to two days before and two days after the full moon, followed by another set of three-day periods until the next new moon. Different tide patterns bring different fish together in the varied reef ecosystem, and netting activity is planned around these regularities. Other constraints on netting included manpower, canoes for transporting people and fish, the presence or absence of spirits in the lagoon (forcing a possible taboo on fishing activity), alternative methods being made available by the arrival of pelagic fish (e.g., tuna), and variability in the fish and bait supply. Which techniques were available to which fishermen on any day, however, depended first on the expected activities and dispositions of powerful, whimsical, and often malicious spirits.

Six spirits inhabited the sea, each controlling a sector of ocean surrounding the atoll in roughly six concentric circles beginning at the seaward reef margin and extending out to the horizon. Fishermen on canoes had to know where each boundary was, which god controlled the sector, and which chant of appeasement was appropriate for it. Because each god had to be familiar with the man doing the chanting, the farther from the reef the canoe traveled, the older the fisherman had to be. This requirement resulted in an age stratification of anglers. This stratification was embodied in the personnel on a canoe and replicated in the seating arrangements in the men's house, where the oldest men were seated farthest lagoonward and younger men seated progressively inland.

Other spirits (or gods) came to the island each evening to sleep in the cult house, leaving each morning to travel southward through the islets and then out to the horizon. These spirits killed anyone encountered on their route, so people stayed indoors until the spirits had left. The gods being unpredictable, avoiding them was sometimes impossible. Occasionally, one or more of them would break off the daily routine and return to the island early. Refusing to be visible, they took the form of sharks, whales, or rays. Fishermen had to be familiar enough with these animals to recognize atypical behavior signaling a god in animal form. The response to a sighting was first a ritual chant of appeasement, then a signal to other canoes to vacate the ocean, and then a race shoreward to notify the high priest. The high priest organized the proper ritual to determine why the god or gods had returned and what they wanted. Ocean and lagoon were ordinarily tabooed until the high priest determined that the gods had resumed their normal routine.

Because of the dangers of deep-sea angling, the high priest had to ensure that the men who worked on the deep sea were trustworthy. If a fisherman erred by misidentifying a shark as a god, for example, the result was the loss of a day or two of fishing. If he misidentified a god as a shark, the result was far worse—death through encounters with the god as well as many other deaths through the gods' vengeance, expressed in droughts, fierce winds, lack of fish, and so on. One way of forfending possibly costly mistakes on the water was limiting access to canoes. The high priest controlled all of the breadfruit trees and drift logs from which canoes were made. His permission was necessary to select a log and to begin construction. His information about a fisherman was supplemented by the secular leader, whose permission was also necessary to begin construction. This leader, the *tomono*, was the sponsor of the men's house connected to the cult house. He worked with the men's house headman to enforce group decisions, helped to organize labor on men's house and cult house repair, and provisioned men's house feasts. His contact with fishermen was instrumental in deciding who was fit

for dangerous work. Less than a third of active fishermen owned canoes before 1917 (Emory 1965; Lieber 1994). The other two-thirds did their fishing in groups organized through the men's house. Canoe ownership, however, did not make a fisherman free to do as he pleased.

All fishing on any given day was coordinated through the men's houses. Each evening, men's house members would meet with the headman, discuss the day's fishing, and plan for the next day. Reports of conditions on the reef, lagoon, and deep sea—what fish were available, what schools of fish were sighted on the reef (particularly by anglers on their way to or from the channels), and the like—were discussed. What netting expeditions would go out the next day, who would go with which group, how the men's house canoes and gear would be distributed, who would lead each group, and where groups would go and when were all decided in the meeting. If fishing groups needed more than the two canoes owned by the men's house, anglers would be conscripted to provide both canoes and personnel for netting groups. For example, the first three days of the new moon during the calm season were full of activity—netting flying fish in the evening, blocking the channels at several islets to catch fish caught by the rapid ebb tides during the early morning, going out to net spinefish on way to the main channel in the late morning, mounting surrounds of rock piles on the reef flat during the afternoon, and angling close to the reef margin both at night and during the day. Late morning and afternoon fishing all required canoes and nets, so personnel and gear transfer had to be tightly coordinated to get all the work done. As tide patterns changed during the lunar month, different netting methods had to be similarly coordinated with bait fishing and angling.

The constraints on fishing activity were, thus, hierarchically ordered. At the top were ritual constraints that determined whether fishing could be done and where permissible and impermissible areas were. If fishing was permitted, then seasonal conditions determined which fish habitats were available. Information about available fish habitats from fishermen at men's house meetings fed into decisions about which specific expeditions would be mounted on a given day and how personnel would be distributed to each. Once these decisions were made, the men doing angling had to cope with availability of bait, tide and wave conditions allowing passage to the deep sea, and current conditions determining how chum and bait would be used. The men doing group netting had to cope with tide patterns, timing of travel to the area to be fished, and transport of gear and fish.

Was this hierarchically organized relationship between the Kapinga and their environment sustainable? The answer must be a qualified yes, because that relationship remained unchanged until the 1920s. Adding the qualifica-

tion of a population's being sustained at a continuous or expanding size, however, renders the answer less clear. Kapingamarangi is typical of what Alkire (1978) calls a "low island isolate." Without regular contacts with other islands (until after 1877), natural disasters such as extended droughts precipitated boom-and-bust cycles. A drought and famine between 1916 and 1918, for example, killed about 30 percent of a population recovering from a slaughter of about half its people by Marshallese castaways in 1870 (Emory 1965:53–55). Wiens (1956) estimates the population as about six hundred before 1870, yielding a variation between six hundred and three hundred persons. In contrast, atolls that are parts of interisland networks (either as interacting "clusters," such as the Tokelaus, or as "complexes," parts of political hegemones of high islands, such as the so-called Yapese Empire) show a narrower range of population fluctuation (Alkire 1978). In times of stress on islands that are parts of clusters or complexes, people rely on aid from friends and kin on other islands. The resident population on such stressed atolls can vary as dramatically as that on an isolate, but migration, not death, accounts for most of the variation.

How should the observer specify the population size for which a particular technology is sustainable? Is the number of people left after the drought the appropriate figure? Does the figure depend on the frequency of such disasters, so that it is necessary also to specify the average or mean number of years between disasters? Should one adjust population size for conditions of isolation or island networks? If so, should researchers isolate populations with *de jure* or with *de facto* populations of clusters and complexes? Or are the isolation of Kapingamarangi and the networks of atolls of, say, Arno in the Marshalls (see Hess in this volume) or Pulap in the Westerns (Flinn 1992) taken as conditions that facilitate and constrain people's adaptations? Perhaps the difference between Kapingamarangi and Arno before colonial contact was the navigation technology that Arno had and Kapingamarangi lacked. Does that difference make for a more sustainable population on Arno than on Kapingamarangi? Or does it simply imply a smaller fluctuation of population size on Arno than on Kapingamarangi? For those who survive the brunt of the typhoon (which Kapingamarangi also lacks), perhaps.

Clearly, the complexities inherent in the variables that determine population size render determination of an atoll's "carrying capacity" highly speculative. Sustainability as a function of population size may make theoretical sense, but any specification beyond a documented range of fluctuation becomes an exercise in arbitrary decision making of the observer. The difference between an atoll isolate and an atoll in a regional network is that they

are part of qualitatively and quantitatively different environments. The technologies that mediate the population-environment relationship are different but comparable as analogues:

Kapinga : Arno :: Gods : neighboring atolls :: ritual techniques : navigation.

If one concludes that traditional Kapinga fishing technology was sustainable, then what happens when innovations are introduced into that technology? Is the technology still sustainable? I address this question first with innovation in precolonial fishing activity and then with data on innovation during the colonial and postcolonial periods.

Innovation in Precolonial Kapingamarangi Fishing Activity

Although isolated until colonial contact, Kapingamarangi occasionally received castaways introducing new knowledge. Castaways from Woleai (about 1780) introduced a new variant of a surround used on the outer reef. This method, called “coconut leaf netting,” is similar to an indigenous technique called “pushing up the lagoon beach.” Both require about thirty to forty men. A purse net is placed either on the outer reef flat (with a four-foot-high tide) or on the inner reef flat (with a lower high tide), with long coir nets attached to each end of the purse net, forming a wide V shape with men holding up each end of the coir net. The rest of the men form a wide arc about one-half mile in diameter, surrounding an area and slowly moving toward the nets. In the older method the men surround the fish, gently sweeping poles along the surface of the water to slowly push the fish toward the reef. In the newer method they use a long rope with coconut leaves tied to the rope every five feet or so to surround the fish. The men slowly pull the rope in toward the nets. Once the fish are inside the range of the coir nets, several men take each end of the coir net and close it behind the fish, preventing their escape. Once the coir net is closed, the fishermen continue to push the fish into the purse net, whose ends are then closed, trapping the fish. The major difference between these two methods is that the older method nets only larger fish, such as parrotfish and larger surgeonfish, that cannot hide in the crevices of rocks and coral heads. The smaller fish left untouched attract other larger fish to the area within a few days. The coconut leaf method, however, nets all of the fish, as the smaller fish flee their hiding places at the approach of the coconut leaf. It takes weeks until the area is ready to be fished again.

The older method was used mainly for supplying small feasts, family affairs where the prestige of supplying larger fish to guests is important in

making a splash. The newer method was used to supply larger groupings with lots of food. Because of its relative efficiency, it was the method of choice during the windy season, when none of the methods requiring canoe travel in the lagoon was available. Its popularity prompted much scouting of the reef for additional places where a net could be set. Fishermen alternated the use of this method with other netting techniques available for the windy season, such as netting goatfish and soldierfish on the outer reef during the day and at islet channels during the evening low tide. Pole and line fishing and angling in the lee of the wind supplemented netting. During the calm season, neither of these surrounds was used often.

These two netting techniques differed in only two features—the use of poles as opposed to the use of a rope with attached leaves and the necessity of changing catch sites more often because of the larger and more varied catches of coconut leaf netting. There was a significant overlap of important features such as their identical personnel and organizational requirements. Their different catch profiles allowed for segregating their uses into different, complementary contexts. Their potential for overexploiting reef fish was constrained by diminishing returns in catch size, making other techniques more attractive. The conclusion that coconut leaf netting was sustainable is warranted by its compatibility with other catch techniques and the fact that this technique is one of the very few that has survived twentieth-century technological and social change, remaining part of the current repertoire (although it, too, faces obsolescence).

All of the other examples of technological innovation in fishing activity on Kapingamarangi are part of the larger context of colonial contact and domination of the atoll by three successive colonial administrations, resulting in a sequence of profound social organizational changes. The relatively simple case below illustrates problems of innovation and obsolescence in a context in which technological change results from diffusion rather than planned development. The data on change in the next two sections focus on whether a particular population-to-environment relationship can sustain particular items of technology.

Innovation in the Colonial Context

Regular colonial contact resulted in Kapinga traveling to other islands for periods of days, months, and years, with some young men learning new fishing techniques and introducing them on their return to the atoll. One such technique was the use of the throwing net, learned from Japanese fishermen on Pohnpei Island in the early 1900s. The throwing net was introduced in 1920 after the atoll's conversion to Christianity, which replaced the ancient

religion that constituted the major constraint on fishing activity. The throwing net rapidly replaced four group netting techniques that required twelve to twenty men. The throwing net could cover the same area of the reef (or deep water just seaward of the breakers) as a surround group. Since the net's areal coverage eliminated the necessity of surround, it took less time to conduct. One person with a throwing net could net about the same number of fish as a surround group. The use of a throwing net also replaced two pole and line methods used on the inner reef. Both of these pole and line techniques required several men fishing together to be efficient.

Of these four obsolete netting methods, one was conducted on the outer reef and the others at surge channels at the outer reef margins. Two of the four were young men's sport. The method practiced on the outer reef flat, for example, was called "netting while glancing up." It was used at tide pools on portions of the outer reef flat when afternoon high tides stayed steady at about ten to twelve inches. Two or three older men holding a purse net at the lagoonward edge of the tide pool directed groups of six young men, who, at a hand signal, would run screaming through the tide pool, chasing the fish feeding there to the purse net.

The other sport method was called "netting while strolling seaward," conducted during the calm season, when late afternoon tides reached twelve inches, and sea bass, trevally, surgeonfish, and triggerfish came to the reef margin to feed. One or two older men directed a group of twelve to fourteen young men, who surrounded the fish at the seaward edge of the outer reef margin and, at a hand signal, swam and ran screaming through the surf toward the reef, chasing the fish before them into a hand-held net set at the base of the surge channel.

The other two netting methods took advantage of weak wave action during the late afternoons of the first and third quarters of the lunar month, when surgeonfish and squirrelfish feed in the breakers. Spotted surgeonfish are easily frightened, so surrounding them took time as men swam out to deep water and, using poles with a slow, sweeping motion, slowly herded the fish toward a surge channel at the reef margin, where two men waited with a hand-held net. The men kept a low profile in the water and timed their push so that the fish went in waves to the net. Striped surgeonfish and squirrelfish are less easily frightened, so the push method used for them took less time.

The hardware for conducting these four types of expedition was relatively simple and accessible—a purse net for one and poles and a hand-held net for the others. The organization of these expeditions was simple—one or two men led and held nets, and the others conducted the surround. All (with the partial exception of netting striped surgeonfish) were organized through the men's house. Kapinga fishermen retained the capability for mounting these

four types of expedition well into the 1950s, and the fact that each of these methods was conducted for two or three days per lunar month during the calm season obviated overfishing. From a technological perspective, these usable techniques became expendable after the introduction of the throwing net. But there is a good deal more to expendability than technology in these cases.

The introduction of the throwing net coincided with a reorganization of the atoll social order following a disastrous drought and famine from 1916 to 1918 that claimed the lives of ninety people and the ancient religious order among its victims. The secular chief, the *tomono*, had emerged as a political power on the atoll owing to his position (which colonials called “king”) as liaison with the colonial agents visiting or living on the atoll. Conversion to Christianity left this man and the men’s houses as the surviving political institutions. The “king” was also the native pastor of the (Congregationalist) church, and he used both the pulpit and monthly community meetings to communicate atoll policy.

By 1920 Kapinga landowners found themselves in control of their own breadfruit trees with no one to prohibit either their building canoes or their using them whenever they wished. The introduction of a new style of canoe from Nukuoro Atoll, 164 miles to the north, helped to spark a frenzy of canoe construction after 1922. The Nukuoro canoe was faster, more maneuverable, and required far less wood and time to construct than the indigenous one. By 1947, 243 of these canoes had been built (Emory 1965; Lieber 1994), rendering the traditional canoe obsolete.

Deep-sea and lagoon angling had always been the most prestigious fishing methods, and with equalized access to canoes (by owners and their crew members), the number of men angling tripled in the thirty years following the collapse of the ancient religion. As the frequency of angling increased, that of group netting decreased. While men’s house membership remained steady, their organizational capability weakened, particularly since the headmen had no way of enforcing men’s house decisions, even when there was a consensus. The men’s houses continued to be places where young, unmarried men slept and where men of all ages met to talk, repair gear, and plan expeditions for feasts or alternatives for bad luck in angling expeditions. What helped maintain men’s houses as viable institutions was their emerging political functions as places where the “king” and his assistant could build consensus on policy issues. Work schedules, however, had changed, and netting became one alternative to angling or, particularly during the windy season, a supplement to angling.

The organization of fishing activity had changed as its higher-level constraints changed. Almost anyone who wanted to participate in angling expe-

ditions could, and besides the throwing net, spear fishing with diving goggles and a hand-held spear had become popular among younger men, who were the first to explore underwater fish habitats. The throwing net made it possible to continue to catch the same fish that had been targets of the four obsolete methods. But the fact was that the personnel requirements for these methods could no longer be consistently met. The organizational infrastructure that made these netting methods possible no longer existed. Thus, from a social institutional perspective, these four netting techniques were not only expendable, but also, and more important, unsustainable—organizationally unsustainable.

Technology, Authority, and Sustainability

The precolonial organization of fishing activity was a nested hierarchy with the high priest at the top. The Kapinga conception of community was an organized response to danger from the outside—from the gods, ultimately—so that the community was identical to the congregation, which was headed by the high priest (who could communicate with the gods). He was assisted by the *tomono*, whose position as the sponsor and enforcer of the men's house connected with the cult house gave him control over a considerable labor force. The men's house headmen were the ones to whom the high priest communicated information about the nature of spirit activity on the water and which areas were open or prohibited to fishing. The headmen used this information in nightly men's house discussions to plan the next day's activities. The result of this structure of authority was a regulation of fishing activity that spread catch pressure over some two hundred species of fish over the course of a year. The men's house was ideally suited for the communication of authoritative information and the exercise of authority over coordination of activities for several reasons: (1) the activities that the men's house coordinated shared considerable overlap of critical features, most requiring an organized group of men and several types of gear (nets, traps, and ropes), making a standing group the most efficient way of organizing the activities; (2) it was a central place where information could be disseminated; and (3) it was a multipurpose institution, coordinating fishing, distributing labor for cult house projects, housing unmarried men, serving as the forum for nominating a new high priest, and providing storage for canoes, nets, and other gear.

The community organization that followed the collapse of the cult house was no longer hierarchical, but it had important continuities with the traditional order. The order that developed in the 1920s consisted of four separate but connected institutions—the chief, the church, the men's house, and

the community meeting (committee of the whole). The chief (or king) was also a pastor of the church, and he used that latter position to legitimate his chiefly decisions. The chief used the men's houses to help formulate public policy and to create consensus for them prior to the community meeting, where decisions were discussed and ratified. This organization of distinct institutions connected together by the person of the chief gave the image of autocracy while having the substance of carefully managed consensus. Like the high priest, however, the chief was the liaison between the community and powerful outsiders—the Japanese colonial administration and Jehovah. While his policies were sometimes questioned, his authority was not.

The men's houses maintained their membership under the new order. Even as more members opted for deep-sea and lagoon angling, the men's houses continued coordinating netting expeditions requiring large groups. The efficiency of men's house organization for these activities was obvious, as was its role in communicating information about fishing conditions and organizing large groups for labor, as for community feasts or work on the church house. Part of the reason for the continued role of men's house fishing expeditions was a radical change in work scheduling owing to the introduction of a church calendar that divided time into weeks, months, and years. The week was the most important, since Sabbath meant no fishing or other work, making Friday the day for getting vegetable foods from land on the outer islets and Saturday the day for getting enough fish for two days' worth of meals. When tuna were not in season, Saturday netting expeditions were required. Fishermen's work weeks were five-day weeks, weather and other projects permitting.

With the establishment of the American administration (the U.S. Trust Territory of the Pacific Islands) after World War II, the Kapinga social order underwent yet another transformation. The last chief abdicated his position in favor of a chief magistrate, to which position he was immediately elected. Using the American model learned in high school, he set up and trained an elected legislative council of ten men. Two local-court judges were later added, and the atoll was chartered as a municipality of Ponape District in 1960. The elected officials quickly learned that their supposed powers of self-determination were limited by a whimsical administration and an increasing number of bureaucratic agencies of the administration that controlled school, dispensary, cooperative, and other policies affecting local affairs. Authority on the atoll became fragmented in a way that reflected the bureaucratic organization of departments and agencies of the colonial administration. Characteristic of these new institutions was their separation from the church and the irrelevance of the men's house to deliberations on public policy. Such deliberations were now the prerogative of the legislative council and its

committees. From the late 1960s onward, the location of authority became increasingly uncertain.

The results of the gradual ambiguation of authority are clearly seen with regard to the coconut leaf netting method that began this account. This catch technique, a mainstay in the Kapinga repertoire for two hundred years, had ceased to be used by 1982. The reason, according to fishermen, was that the headman could no longer control “young men” during the final phase of the surround. Once the coir net is closed behind the fish, they are packed together and looking for escape routes. It takes several men holding the net to continue to push them toward the purse net that traps them. Younger men brought spear guns, and instead of holding their parts of the coir net, they speared the fish inside, allowing most of them to escape through the openings they created. When younger men ignored the headman’s subsequent ban on spear guns at coconut leaf netting, the headman refused to conduct any more expeditions.

Unlike the four netting techniques made obsolete by the throwing net and the organizational changes of the 1920s, the organizational infrastructure to mount a coconut leaf netting expedition existed. Missing was the authority of the headman to compel all participants to follow instructions to complete the catch. Coconut leaf netting is now an unsustainable activity—an outcome of change at two levels of social context. The organization for the implementation of the technology remained but community organization from which the men’s house derived its authoritative constraints on its members had changed. The men’s house headman’s lack of authority was an outcome of changes in the organization of the community, whose fragmented authority structure left the men’s house as one more institution, like the church, the school, the court, the cooperative, the dispensary, and the council, with no central integration from which authority could be derived. This catch method was technologically and organizationally sustainable, but politically unsustainable.

Obsolescence and Sustainability

It is clear that innovation can augment the technological repertoire, but it can also render parts of that repertoire obsolete. The four cases presented above exemplify processes involving fit, obsolescence, and categories of sustainability. Table 1 summarizes the outcomes of these processes. The table lists all of the catch techniques that were verifiably obsolete as of 1990.

Of the thirty-eight techniques listed in Table 1, all but four are technologically sustainable. That is to say, for the remaining thirty-four techniques, the hardware and the knowledge of how to use it were still available as of

1990. By examining the four technologically unsustainable techniques, the temporal property of sustainability becomes apparent.

Two of these techniques, NC4 and NC5, are described as organizationally unsustainable by the 1920s. By 1982 they were also technologically unsustainable, because the men who knew how to organize them had died. None of the old men who described these techniques to me had actually participated in them. Similarly, netting at the rock piles (NC) had not been practiced since 1920, and no one was considered capable of leading such an expedition. The rainbow runner surround had not been practiced for about twenty years, and not only was the men's house headman without the power to control the younger men on this very dangerous expedition, but he had never led one during his tenure and did not consider himself knowledgeable enough to lead one. Technological sustainability turns on what it means to know something, not only in these cases, but in all cases.

To "know" (*iloo*) something is to have had repetitive experience with it to the point of being "comfortable" with or "accustomed" to it (*wouwou*). It is this repetitive experience that gives one the right to know something (see Lieber 1994:116–118, 178–180). One's age, sex, family status, and the like confer eligibility to learn particular things. Men have the right to know how to fish, but they do not have the right to know how to plant and care for taro. Men's house headmen have the right to know how to lead rainbow runner netting expeditions, while those who are still apprentices do not have the right to know (but are acquiring it). Knowing how to do something, moreover, is not the same as knowing how to organize and direct others in doing it. Because experience and the right to know are acquired by persons, all that is glossed as "knowledge" is personal knowledge rather than the Western concept of a body of accumulated information that is (at least potentially) available to everyone. As for rights over knowledge, when those with the right to know (from experience) disappear, the technique disappears. The techniques listed as technologically sustainable are only temporarily so. By the year 2010, all techniques listed in Table 1 will be technologically unsustainable, and the number of obsolete techniques will have nearly doubled.

The catch methods in Table 1 give a slightly distorted picture of the relative vulnerability of traditional catch methods to obsolescence. By measuring the percentage of obsolete to nonobsolete methods in each category of catch technique listed in Table 2, the profile of relative vulnerability of catch methods (in Table 1) to obsolescence becomes quite clear.

The processes of obsolescence vary by category. Weir fishing is the most vulnerable. Minnow weirs, set up on the reef flats adjoining the central islets to trap minnows as they crossed the reef, became obsolete after red tides wiped out the minnow population in the 1950s. Goatfish weirs were

TABLE 1. **Obsolete Fishing Techniques**

Technique	Replaced By	Dropped Entirely	Technologically Unsustainable	Organizationally Unsustainable	Politically Unsustainable
Netting					
NC—netting at rock piles	—	associated with 1916 —1918 famine	+	+	+
NC3—spreading out to lagoon beach	—	—	—	+	+
NC4—strolling seaward	throwing net	—	+	+	—
NC5—glancing up	throwing net	—	+	+	—
NC11—net rainbow runners	night angling	—	—	+	—
NC12—spotted surgeonfish	throwing net, spear	—	—	+	—
NC14—Waigeu drummers	throwing net, angling	—	—	+	+
NC15—flying fish (surround)	throwing net	—	+	+	—
NC16—striped surgeonfish	throwing net, spear	—	—	+	—
NC17—triggerfish	angling	—	—	—	—
NY1—soldierfish	spear	—	—	—	—
NY2—squirrelfish	trap, spear	—	—	+	—
NW1—coconut leaf netting	—	—	—	—	+
NW2—diving	spear, angling	—	—	+	—
Pole and line					
PC1—coral heads	spear	—	—	—	—
PC2—handfish	throwing net, spear	—	—	—	—
PC3—triggerfish	angling	—	—	—	—
PC4—bonito	trolling	—	—	+	—
PC5—Waigeu drummers	throwing net, angling	—	—	—	—
PC6—snapper	—	+	—	—	—

PC7—mullet	throwing net	—	—	—	—
PC8—crimson squirrelfish	throwing net (bait fish)	—	—	—	—
PC9—goatfish (<i>madu</i>)	—	men refuse to chum for 4 days	—	—	—
PC9—garfish	throwing net	—	—	—	—
PC10—goatfish (<i>gala</i>)	—	men no longer chum 4 days	—	—	—
PC11—bluespot mullet	—	men no longer chum 5 days	—	—	—
Weirs on reef					
WR1—minnow	—	+	minnow popula- tion gone	—	—
WR2—goatfish	—	+	—	+	—
WR3—garfish	—	+	—	+	+
Traps					
T2—stinky trap	angling	—	—	—	—
T4—flat trap (reef eels)	—	+	—	—	—
Lagoon angling					
LD4—Vlaming's unicornfish	—	men will not chum for 5 days	—	—	—
LD5—Waigeu drummers	spear	—	—	—	—
LD6—gold-banded fusilier	—	men will not chum for 5 days	—	—	—
Deep-sea angling					
DC3—buried line	canoe angling	—	—	—	—
DC4—chumming the hole on rocks	baited hook tied on rocks	—	—	—	—
DY3—sharks at drift logs	—	+	—	—	—
DC10—crimson squirrelfish	—	+	—	+	ritually no longer required

TABLE 2. **Percentage of Obsolete Catch Methods by Category**

Category of Catch Method	Total Methods in Category	Number Obsolete	Percentage Obsolete
Weirs	3	3	100
Netting	27	14	52
Pole and line	15	7	47
Trap	5	2	40
Angling	29	7	24

simply abandoned when the men’s houses no longer organized their maintenance. With an increase in angling and with at least four other techniques for capturing goatfish, there was neither the interest nor the organization to use or maintain these weirs. Garfish weirs were the property of two priestly families, whose ownership was recognized by token gifts of part of a catch. These fell into disuse after conversion to Christianity. This change can be seen as part of the decline in the frequency of group-organized expeditions, but garfish weirs also had the taint of the heathen “time of darkness.”

Netting depends on organizing a group, which depends on institutionalized differences of leadership and followership and institutionalized contexts of organization. The decay of men’s house organization leaves netting expeditions as ad hoc procedures, dependent on men recognized as capable of leading expeditions. As these older men retire, there are increasingly fewer younger men with the knowledge and authority to replace them. This process of diminishing opportunities for leadership experience began with the collapse of the ancient religion and was accelerated by political reorganization of the atoll after 1958 (Lieber 1994:131–188). By the 1960s the men’s house organized only the large, coconut leaf netting surround and the capture of three species of spawning fish—coral trout, rabbit-faced spinefoot, and vermiculated spinefoot—as described above) on the outer reef. Other netting expeditions were organized on the spot. Of fourteen obsolete netting methods, all but one required a minimum of eight men to perform. These techniques are the most vulnerable to changes in political and institutional organization, as the decreasing frequency of netting expeditions resulted in decreasing frequency of opportunities to learn the catch methods’ organization, procedures, and skills. Thus, it is political changes that have resulted in (and continue to drive) the obsolescence of netting techniques.

Pole and line techniques, unlike netting, are highly individualized. While they are effective catch methods, they lack the prestige of angling. As canoe ownership increased, the frequency of pole and line fishing decreased rapidly, particularly those techniques that required several days of chumming before

using a hook and line. Men no longer see the need to spend three to five days chumming when they can go into the deep sea with less chum and bring home fish the same day. The pole and line techniques that survive are, like surviving netting techniques, ad hoc procedures that can yield a catch in a single day.

Of the two obsolete trapping techniques, the white eel trap was simply abandoned with the rush to acquire canoes and go angling. The stinky trap, a very large trap for fish like the giant snapper, jewfish, and other large fish, was replaced by angling, which required only one trip to the pass as opposed to the two to three trips necessary to place, check, and empty the trap.

The processes of obsolescence listed here all derive from organizational change in the atoll sociopolitical order. That is, obsolescence is an outcome of systemic social and political change. Only two technological innovations have in fact qualitatively changed Kapinga fishing methods—the spear gun and the throwing net. Metal fishhooks, manufactured lines and nets, cloth and polyester sails, the Nukuoro canoe, and outboard engines have replaced their local equivalents, but these items are not responsible for the obsolescence of the thirty-eight techniques listed in Table 1. The throwing net replaced only six techniques, and spear fishing has replaced two netting techniques already replaced by the throwing net. These six techniques were already organizationally unsustainable with or without the throwing net.

Innovations in Kapinga ritual and political organization (that equalize access to canoes) account for the accelerating obsolescence of traditional fishing technology. While catch techniques in use have not changed very much, their deployment has changed, and with this change has come a change in the population-environment relationship. Nothing illustrates this change better than the atoll landscape.

Change, Differentiation, and Obsolescence within the Atoll Landscape

Colonial contact brought to the atoll a wide variety of Western goods that Kapinga desired. These demanded cash, mainly from the sale of copra. By 1954, 80 percent of pandanus trees had been replaced by coconut trees (Wiens 1956). The introduction of *Xanthosoma* taro, which quickly became a dietary staple, not only largely replaced the native *Colocasia*, but also resulted in the tripling of central islet areas given over to taro pits, replacing breadfruit, pandanus, coconut, and other plants formerly grown in these areas. After 1914 access to cash was augmented by emigration to Pohnpei for contract labor, wage work, and commercial fishing. The founding of a Kapinga colony in Porakied (in Kolonia town) on land leased from the Japanese colonial administration enabled a steady flow of people between Pohn-

pei and the atoll (Lieber 1977). These opportunities were further augmented after World War II by U.S. Trust Territory of the Pacific Islands development programs, which brought wage work (including positions as teachers, nurses, and radio operators, legislative stipends, and jobs in public works programs) to the atoll and provided educational opportunities for Kapinga to qualify for positions on the atoll and on Pohnpei. The incorporation of the Federated States of Micronesia has brought yet other opportunities for acquiring cash.

All of these activities procure cash for what has become a subsistence fishing technology that requires money to implement, for hooks, lines, leaders, weights, spear guns, outboard engines and parts, and gas and oil. Acquiring cash has focused people's attention outward to sources of cash and the education, training, and institutions that make cash accessible. Pohnpei, its associated atolls, other islands making up the former U.S. Trust Territory of the Pacific Islands, Guam, Saipan, Hawai'i, and the U.S. mainland are all places familiar to Kapinga people through personal experience and the stories of kin and friends. Kapinga working as fishermen and sailors have become familiar with Rabaul, Port Moresby, Honiara, Pago Pago, Fiji, Japan, Taiwan, Hong Kong, and Manila. Eight Kapinga families now live on the U.S. mainland. The world outside the atoll has become ever more differentiated since 1877, that differentiation corresponding to the growth of opportunities for financial gain.

The atoll landscape, at the same time, has become ever less differentiated. Figures 1 and 2 show the place names of every sector of the outer reef, the inner reef, and the coral heads in the lagoon. These place names were pieced together in 1982 from the knowledge of the oldest fishermen on the atoll, men in their seventies and eighties, and cross-checked both among them and with slightly younger men who knew names and locations of many but not all sectors. Younger men in their forties and fifties knew correspondingly fewer of the sectors. Knowledge loss formed a pattern by age category, with 90 percent retention among the oldest men (who had participated in all but two of the eighty-five catch types and disagreed only on sector boundaries). Men in their sixties knew most but not all of the outer reef names, between 50 and 60 percent of the inner reef names, and 80 percent of the coral heads. Men in their forties and fifties knew 60 to 65 percent of the outer reef names, 40 to 50 percent of the inner reef names, and 65 percent of the coral heads. Among the latter group, there were some names of inner and outer reef sectors that these men had never heard, some that they had heard but located incorrectly, and some that they had heard but could not locate.

These patterns of loss and retention correspond to the sorts of fishing experience that each age category has had with the shift from group netting, much of which was done on the inner reef, to angling, which is done in the

lagoon and by the larger coral heads and on the deep sea. Place names on the outer reef were and still are used to mark a fishing spot in deep water by triangulating with a feature of an islet across the lagoon or with a second named place. More of the outer reef place names have been retained, because these are still in use. Inner reef names are becoming obsolete at roughly the same rate as netting methods. Names of coral heads used for angling, bait fishing, and spear fishing have been retained, while those not so used (mainly in the northeast quadrant) are not remembered or learned.

In an inverse ratio, as Kapinga people's map of the world outside the atoll has become more differentiated, the map of their own island has become more homogeneous. Like the New Zealanders described by Dominy (this volume), those with differing interests map the landscape differently. In the New Zealand case, communities of interest differ in terms of economic, political, and ideological position, and the features of the landscape they contend over vary accordingly. In the Kapinga case, interest in and investment in the landscape vary within the same community by each generation's different experience of that landscape. For each of the competing interests in New Zealand, the high country constitutes a different sort of environment. For each Kapinga generation since 1920, the same atoll has constituted a different environment. Relationships between people and different parts of the environment—both with places and with the fish species that inhabit them—have been severed.

Change and Sustainability

Traditional fishing activity incorporated a sustainable technology until 1920 in the two senses in which the term is used here. The repertoire of eighty-five catch techniques with its associated hardware and organizational modes maintained a relationship between the atoll population and a wide variety of fish habitats in the lagoon, its coral heads and inner reef, the outer reef, and the deep sea, encompassing over two hundred species of marine animals. The population sustained the entire repertoire for several centuries. Is this technology sustainable today? The question is moot, since the technology, population, environment, and relationships among them have all changed.

The atoll population is only one part of the total Kapinga population. More Kapinga people live in Porakied village on Pohnpei than on the atoll, and Kapinga have two blocks of homestead land in Madolenimhw in the southern part of Pohnpei. Other Kapinga live in Guam, Hawai'i, and the United States. The off-atoll population is more than double that of the atoll population, which has remained steady at about 450 people since the 1950s (Wiens 1956; Lieber 1977, 1994). Between 1947 and 1950, there were almost

600 people living on the atoll (Emory 1965), with about 150 people repatriated from Pohnpei by the U.S. Navy. Once regular shipping between the atoll and Pohnpei resumed, people began returning to Pohnpei. The atoll population reached 450 by 1954 and has remained at that level since, with Pohnpei drawing off natural population growth on the atoll. It has been during this period, from 1956 onward, that fishing techniques have become obsolete at an accelerating rate while the political organization, with its redistribution of authority, has been transformed.

Fishing technology during this period has changed in a patterned way: the technology used today concentrates on angling, spear fishing, and netting techniques that can be organized on an ad hoc basis. That is, out of the total range of traditional techniques, a limited range has been selected—those that can be organized on an individual or small-crew basis. This selection has left Kapinga fishing technology specialized for deep-water and lagoon angling, supplemented by spear fishing, moray eel trapping, diving for clams, and occasional netting expeditions. The range of exploited fish habitats has narrowed accordingly. This is an evolutionary pattern of change. It is irreversible—even if fishermen could remember how to conduct obsolete catch methods, they no longer know where to conduct them, nor does the current social order provide the personnel, authority, and organization to support them. This pattern of change is analogous to the evolution of the horse from a browser to a grazer, relying on part of its previously exploited environment.

Although Kapinga fishing technology is part of an evolutionary change in the organization of the population-environment relationship, the level of systemic change is that of the organization of fishing activity and its instrumental linkages with other activities that produce cash. At a higher level of systemic organization, that of Kapinga assumptions about the context of these activities, there has been no detectable change whatever. That is, Kapinga people continue to assume that control over conditions of their environment and over marine resources lies outside the atoll social order. In the pre-colonial period, control was vested in the gods. Since 1920 control resides in Jehovah and in successive colonial administrations. While the agents of control have changed, the locus of control has not. Given this cultural premise, Kapinga people's access to resources and to influence over local conditions has always depended on their knowing what the powerful outside agents want and on complying with their demands and desires. Ritual activity, education, wage labor, copra production, and craft production are all forms of compliance that Kapinga use to maintain their relationships with powerful outside agents. Put another way, they are all strategies for implementing the cultural premise that defines the relationship between Kapinga people and the world outside the atoll.

The question remains, is current fishing technology sustainable for the atoll population? The short answer is that as long as current implementation strategies for linking Kapinga people with outside agents and agencies work, then the technology is sustainable. Sustainability depends, in other words, on the maintenance of a steady if not growing cash flow to the atoll through government salaries and stipends, copra production, public-works projects, handicraft production, and the success of planned commercial fishing that involves the sale of fish to the supercargo of the field trip ship for resale on Pohnpei. These sales involve government subsidies of a walk-in freezer for the atoll and retrofitting and maintenance of a freezer compartment on the field trip ship.

The maintenance of this cash flow to the atoll depends on levels of funding for the Federated States of Micronesia, which depend on the relationship between the Federated States and the United States, between the Federated States and a consortium of countries sponsoring fishing fleets in Micronesia, between the Federated States and the Asian Development Bank, and so forth. The decisions affecting these relationships are made in Washington, Suva, and Tokyo and, lastly, on Pohnpei, where the national government determines disbursements to the states. The portion of funding going to the atoll depends on the negotiating skills of its representative to the Pohnpei State Legislature, where Kapingamarangi is one of eleven municipalities competing for a shrinking pool of dollars.

Perhaps ironically, population size may be a better indicator of the degree of sustainability of current fishing technology than it was in the precolonial context. Given that gas supply is a major constraint on fishing activity, any serious decrease in cash flow to the atoll would be reflected first in the frequency of fishing and, thus, in catches. A decreasing supply of fish would support a smaller population than the current one, resulting in increased emigration to Pohnpei. That is, without change in the technology and the population-environment relationship that it constrains, change in amounts of available cash (for whatever reason at whatever systemic level) would be reflected in changes in population size.

Conclusion: Levels of Sustainability

The contribution of cultural anthropology to understanding what makes technology, development, or any other planned change sustainable is the same as its contribution to understanding any other outcome of complex processes in human communities. It is an understanding of the ordering of complex relationships between people and between people and things, and of how those relationships are informed by shared patterns in how people perceive and implement those relationships.

Anthropologists infer the organization of human action and interaction (with the human and nonhuman environments) from repeated observation, calling these inferences patterns. We then seek to explain the principles that structure these patterns, some of which can be articulated by people and some of which cannot and must be inferred. Anthropologists refer to this latter sort of inference as “covert” or “implicit” culture. I use the term “cultural premises” to refer to the unconscious axioms that order people’s perceptions and representations of the ways that they organize their relationships. How our observations and inferences proceed depends on two kinds of theories—a theory of organization and a theory of culture (and the relationships between these theories).

In this article, I have taken advantage of cybernetic theory about how systems are typically organized and how they change over time. In the version of cybernetics used here, heavily influenced by Gregory Bateson, culture is integrated with social systems as a theory of how humans come to share common ways of perceiving the things, people, and relations among them that make up common experience (Lieber 1994:27–34). This integration of theories of organization is the perspective from which thinking about sustainability makes sense in the observer’s universe.

The concept of sustainability, whether the specific focus of observation is technology, economic or other development, or social or ecological policy, is about temporal maintenance of human activity in relation to the environment of the activity and of the human community that contextualizes both. It is the activity that directly affects people and the environments for which that activity is designed, not the hardware that implements the goals and strategies of the activity. The use of hardware has its own requirements, and these requirements are part of the constraints that shape the activity. As soon as researchers focus on human activity as our unit of analysis, we are immediately enmeshed in the organization of the constraints that give that activity (and others related to it) its shape. The systematic organization of constraints on an activity is the key empirical generalization for understanding what is and is not sustainable, for it is this organization of constraints that one tracks over time. Even in this relatively simple example of technological innovations in Kapinga subsistence fishing, it is apparent just how complex and how layered the organization of constraints (and changes in that organization) can be. It is because this complexity is systemic that we can attempt to make the kind of prognostication that sustainability represents. That is, we are in a position to predict a range of outcomes of the population-environment relationship when we understand the levels of constraint and the ordering of those constraints on that relationship. What we infer are levels of change and of stability (Lieber 1977).

The constraints that shaped precolonial fishing activity were hierarchically ordered, following from the hierarchical order of local institutions. The cult house constrained men's houses, which constrained the activities of fishermen (taking into account the conditions of fish habitats). Religious constraints were satisfied first, men's house decisions next, resulting in individual fishermen either being assigned to fishing groups or left free to go angling. The sustainability of new fishing techniques in this context depended on the fit between the features of the technique and this hierarchy of constraints. The coconut leaf netting technique, introduced in the 1780s, shared important features with indigenous techniques. It was sustainable both in the sense of being doable and in its contribution to sustaining the population.

Organizational change following conversion to Christianity offers an example of what Herbert Simon (1996) calls the "near decomposability" of hierarchical systems. Under radical change, hierarchies rarely collapse entirely. Instead, they usually break down into their most stable components. In the Kapinga case, the men's houses and the secular chief remained stable institutions, enabling the transition from a theocratic hierarchy to a chieftainship whose legitimacy was based on the chief's leadership of the church and his ability to use men's houses to form political consensus. Without the ability to enforce decisions about daily fishing activities and because anyone with access to a breadfruit tree could now own his own canoe, the frequency of angling increased at the expense of group netting. The traditional hierarchy was gradually breaking down to the individual fisherman or the canoe crew as the most stable organizational unit.

In this context of organizational change, the study of obsolescence affords an avenue to understanding the kinds and combinations of processes whose outcomes are sustainable or unsustainable activities. First, we must be clear that we observe change and stability at different levels of organization. While angling gear has changed—manufactured lines, hooks, outboard engines—angling techniques have changed little since 1900. The organization of fishing activity has changed radically over the same period. Not only have group netting, use of weirs and traps, and pole and line fishing decreased in frequency, but the institutions that coordinated their deployment either disappeared or lost their ability to require participation by the 1920s. But change at the institutional level was also an outcome of fishermen's new-found opportunity to act on the unchanging value that people placed on the personal autonomy that canoe ownership represented. Given a choice, any Kapinga man would rather be angling on a canoe than netting in a group. The collapse of the cult house presented fishermen with that choice. It is in this context that a researcher observes the obsolescence of fishing techniques.

The four examples of obsolete techniques above illustrate the levels of processes that have rendered the catch techniques both obsolete and unsustainable. These processes include *technological unsustainability*: fishermen no longer know how to conduct particular expeditions; *organizational unsustainability*: fishermen no longer have the organizational capacity to conduct particular expeditions; and *political unsustainability*: leaders of fishing expeditions no longer have the authority to enforce their commands. The four examples are keys to understanding the array of obsolete techniques presented in Table 1. Ultimately, their obsolescence represents various outcomes of decentralized control over the distribution of canoes and the coordination of fishing.

The rapidly increasing technological unsustainability of the techniques in this list and the obsolescence of named fish habitats on the reef and in the lagoon exemplify change at one level—the loss of the knowledge and capacity to conduct expeditions—and stability at another. Given the Kapinga concept of knowledge as an outcome of personal experience based on one's right to have that experience, knowledge disappeared when those with rights to train others to conduct expeditions failed to do so. Without the opportunity to master a technique, the right to know disappears. Thus, change at the level of activity is constrained by continuity at the level of cultural premise (defining what “knowing” means). This stable premise ensures that all of the techniques listed in Table 1 will become technologically unsustainable and that the list will continue to grow.

The technology that has replaced these obsolete techniques includes most traditional angling methods, some new ones, spear-gun fishing, a few older netting techniques, and the use of outboard engines that considerably reduce travel time. This technology represents an evolutionary shift in its selection of part of the traditional repertoire for elaboration, and it requires activities that generate cash for much of its performance. Cash generation focuses people's attention on relationships with agents and institutions outside the atoll. Although these activities represent change at the social organizational level, they implement an unchanged cultural premise about the locus of control over resources and environmental conditions.

The sustainability of this new technology depends on cash flow for gasoline, engines and parts, and gear. Cash flow is constrained by opportunities for earning cash and by the political leverage the atoll representative to the state legislature has to get funding for atoll projects. Available funding is constrained by the (decreasing) levels of income under the Compact of Free Association between the Federated States of Micronesia and the United States and by other agreements that the Federated States can make, for

example, deriving cash from fishing licenses for Japanese vessels. The amounts of money available in the future will depend on the next agreement between the Federated States and the United States, which continues to depend on the U.S. perception of the political and military importance of the Federated States. Nero, in her article later in this volume, sees this relationship as more stable than a precarious dependency. Indeed, dependency is probably a misnomer—at least for the Marshall Islands—since the United States is as dependent on the maintenance of that relationship as the islanders are. A sustainable fishing technology for Kapingamarangi is, thus, an outcome of sustaining the relationship between the United States and the Federated States of Micronesia.

To the question of whether any X is sustainable, there are two sorts of answers: (1) no, because . . . and (2) yes, if. . . . What follows “because” or “if” are the minimal conditions of systemic variables at relevant systemic levels that must remain constant for the population-environment relation to remain constant. Data on the activities that constitute the relationship either satisfy these conditions or they do not. It is clear, however, that “population” in the population-environment relationship is more than a matter of population size and age-sex categories, which, like sustainability, are but one class of outcome of the population-environment relationship. It is the population as a human community organizing activities that has the capacity for relationship with the environment. In this sense, the Kapinga case is comparable to the examples of the Tongan farmers described by Stevens, the Arno case described by Hess, and the case of the high-country ranchers described by Dominy, elsewhere in this volume. Sustainability in these cases is useful as a prognostication of the outcome of an intervention to the extent that it focuses the observer’s attention on its systemic implications in relation to the activities that constitute the population-environment relationship. The arena of this sort of inquiry is what Stevens and Evans, in their articles, call political ecology.

NOTE

1. See Goodenough 1963:330–347 for a detailed account of the features that shape any activity, how activities constrain one another, and how activities can be used to forecast change. Goodenough illustrates activities analysis with fishing on Onotoa Atoll in Kiribati, making his illustration comparable with data presented here (see also Lieber 1994:154–163). For both theoretical and practical reasons, Goodenough’s method of data collection and analysis is designed for the kind of prognostication that a determination of sustainability demands.

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LEGISLATING A SUSTAINABLE LAND ETHIC FOR NEW ZEALAND

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This article explores competing discourses of sustainability in New Zealand's South Island. As active resource managers, high-country pastoralists' conception of "country" contests predominant reductive and binary models of production/conservation and economic resource/visual resource and suggests a more complicated dynamic between scientific and cultural paradigms of sustainability than has been acknowledged. This dynamic is captured in the internationally driven top-down concept of equitable sustainable land management with a dual commitment to both cultural and ecological diversity as defined locally, formulated as part of the United Nations Rio Declaration of 1992, agenda 21, chapter 13. I examine an emergent high-country "land ethic" by exploring textually and ethnographically the legislative arenas within which discourses of sustainability have been defined and by examining the relationship of economic, ecological, and community sustainability to "country." The article elicits the cultural components of a remarkably transnational and yet strategically local high-country understanding of sustainable land management.

DERIVING MY TITLE from Deborah Bird Rose's "Exploring an Aboriginal Land Ethic" (1988), I respond to her plea for the articulation of an indigenous Western land ethic by exploring competing discourses of sustainability in New Zealand's South Island. Like other theorists working in the anthropology of place, Rose returns cultural agency to anthropologists' understandings of ecological systems while simultaneously advocating an acentered land ethic. She asks that we attend to the political economy of knowledge and that we increase understanding of our role as moral agents in the systems of which we are a part. Drawing on her own ethnoecological studies in

the Yarralin-Lingara area of the Northern Territory of Australia, Rose invites a shift in perception to see how Ngarinman people understand human life as existing with “a living and conscious cosmos,” one that Elizabeth Povinelli, in her work with Belyuen communities in the Cape York Peninsula, has revealed as a sentient environment that her interlocutors call “country.”

While my South Island interlocutors also call their place “country,” I do not propose to argue that the New Zealand pastoral high country, an extensive area of Crown leasehold land, is a sentient environment to the pastoralist families who graze their sheep and live there or to the various national players with an interest in these public lands. But I do want to illustrate, through an analysis of ethnographic and textual materials, the kinds of active resource managers high-country people are as they respond to a transnational rhetoric of sustainability (see also Nero and Hess, this volume). Their conception of country contests predominant reductive and binary models of production/conservation and economic resource/visual resource and suggests a far more complicated dynamic between scientific and cultural paradigms of sustainability than has been acknowledged.¹ This dynamic is captured explicitly in the internationally driven top-down concept of equitable sustainable land management with a dual commitment to both cultural and ecological diversity as defined locally, formulated as part of agenda 21, chapter 13, “Managing Fragile Ecosystems: Sustainable Mountain Development,” at the United Nations Earth Summit in Rio de Janeiro in 1992.²

Rose’s catalyst, Aldo Leopold, implies that ethics may be “a kind of community instinct in-the-making” (Leopold 1969:403), and I examine this emergent instinct by exploring the legislative arenas within which discourses of sustainability are defined and by examining the relation of sustainability to “country” as these discourses pertain to pastoral high country and can be traced historically. In particular, while acknowledging competing aspects in the positions of various stakeholders in the New Zealand high country, I draw on my ethnographic data with one category of players—high-country runholders—and attempt to articulate the particularity of their evolving land ethic. The ethic is part of an immediate ecosystem and responds to Rose’s plea for the development of an indigenous Western land ethic not in the wilderness or in exotic places (and minds), but “in our own back yards, farms and stations” (1988:387). I aim to elicit the cultural components of a remarkably transnational and yet strategically local high-country understanding of sustainable land management.

To provide a historical context, I trace transformations and sociopolitical currents in Crown land legislation as it shaped the pastoral leasehold tenure system, focusing especially on the Land Act of 1948 and the land classifica-

tion system it established. A plural history in which various constituencies articulate ties to mountain lands is often voiced in terms of legal conventions or commercial and technical designations. This history displays the complexity of competing interests that typically interact and intersect in making policy that shapes sustainability (see Lieber, this volume). These conflicts must be examined within the context of changing political parties and market forces in New Zealand farming and shifting values regarding, and definitions of, nature and culture,³ land and nation. The idea of sustainability, then, is contested, processual, and political (see Evans, this volume).

The contemporary focus of my analysis is on the effects of government restructuring with the election of the fourth Labour government in 1984, on a series of subsequent legislative initiatives for land-management reform (such as the 1991 Resource Management Act and the 1995 Land Bill), and on high-country inputs and responses to the concomitant studies and legislative initiatives.⁴ Marsh argues that because "farmers may not take account of impacts of farming which are not directly reflected in prices and costs," their calls on "non-market costs" in natural systems must lead to legislative intervention that will restrict such use in order to ensure that they be sustained (1994:16). Inevitably, then, sustainability must be defined and controlled through legislation. While sustainability operates as a dominant value at the international level (Bradsen 1994:99), it remains "an elusive target" (Marsh 1994:16).

The regulatory arena of land legislation has defined the conditions of high-country occupation, ownership, and management and reveals continuously conflicting values between runholders and others with an interest in these public lands. My purpose is not to intrude on the terrain of scholars in land-resource management who can best assess the relationship between land-tenure legislation, land management, and the degree of range degradation in the South Island (as does the Martin Report),⁵ but rather to illustrate that changes in legislation mark key tensions in New Zealand national culture between constituencies competing to define the high-country landscape and its management, occupation, and ownership. The values at stake include commitment to pastoral use, to freehold and leasehold tenure of pastoral lands, to public recreational access, and to nature conservation, including landscape preservation and species protection, and to a much lesser extent cultural heritage (as in historical or pioneering) protection. A rhetorically consistent and oppositionalized tension emerges between the protection and preservation of a less culturally mediated landscape, often summarized simplistically as a tension between production (pastoral use) and conservation (nature preservation and protection), and the protection and preservation of *pakeha* mountain pastoral culture and its landscape.⁶

Early Legislation: Production and Economic Sustainability

Initially pastoralists were attracted to Crown lands outside settlement blocks because Crown licenses (as they were known), issued for varying amounts of time depending on the province, were generally cheaper than other lands; by 1865 “virtually the whole of Marlborough, Canterbury and Otago, including Southland, was . . . registered and stocked up as sheep or cattle runs, right to the limits of the forested and permanently snow-capped Main Divide” (Centre for Resource Management 1983:33, citing Kevin O’Connor and I. G. Chris Kerr).⁷ Beginning in 1876 with the abolition of provincial governments, pastoral lands were under the jurisdiction of a central government that “was largely ineffective in preventing the degradation of the tussock grasslands through the combined effects of fire, sheep, snow, depression, rabbits, cultivation, war and insufficient knowledge and capital” (Kerr 1984:25); these effects were apparent by the 1880s, coinciding with falling wool prices, and continued until the 1950s (Centre for Resource Management 1983:36–37). Under the 1877 Land Act, licenses were auctioned as their terms expired and sold to the person bidding the highest annual rent for up to ten years, with the preemptive right to freehold 320 acres around the homestead; the system persisted until the 1948 Land Act (ibid.:35).

Management of South Island mountain lands led the government immediately after World War I to commission Leonard Cockayne to “make an economic investigation of montane tussock grasslands,” the results of which were published in a series of articles in the *New Zealand Journal of Agriculture* beginning in 1919 (McCaskill 1969:154). Former High Country Committee chair David McLeod explains that a Southern Pastoral Lands Commission was appointed in 1920 to look into the burning of tussocks, the overstocking and continuous grazing of sheep without improvement, increasing numbers of rabbits, and land tenure (McLeod 1980:16–17). These issues persist today in addition to concerns over the damage to pastoral grasslands caused by introduced hieracium (hawkweed species) and Canada geese, and the intrusion of exotic conifers (wilding trees) into the visual landscape. In response to the commission’s report, an amendment to the Land Act of 1924 restricted burning at certain periods and encouraged more attacks on rabbits by runholders. McLeod notes that little else was done at the time, and in thinking over the thirty-year management of his property, Grasmere, he writes that he “made use of every available square yard, however rugged or inaccessible, and of every plant that sheep would eat, no matter what its value might be to the environment as a whole . . . slowly coming to realise the part that depletion and nutrition played in the struggle” (ibid.:17). In

the 1940s some farmers worked with the commissioner of Crown lands and the Land Settlement Board to reduce rent paid through livestock reduction. For example, in my Rakaia valley field site, Double Hill station reduced its rent from \$1,150 per year to \$750 in 1948.

In 1937 Molesworth, the largest single holding, was abandoned because of rising costs and falling production, and the Crown took over much of the station to “reduce the degradation and erosion of these lands and to achieve sustainable land management” (South Island Working Party on Sustainable Land Management 1994:84). This was a time when rabbits were yet again in crisis numbers and high-country farming, after eighty years of extensive grazing, promised to become uneconomic (see McLeod 1975). The Lands and Survey Department, developed from the department originally concerned with surveying Crown lands and leasing them to settlers, was the administrative body, but its local administrators, the commissioners of Crown lands, were surveyors, not specialists in pastoral use. The simple system used to determine tenure was to lease a run to the highest bidder at auction. Rents, varying widely among properties, were based on sheep numbers. In 1940, seeing their future foreshadowed, the runholders met with the minister of lands, who approved the High Country Committee as an advisory body on all matters concerning the South Island high country. It comprised representatives from each of the provincial land districts,⁸ and in 1945 it was incorporated as the High Country Committee of Federated Farmers. The minister also agreed to appoint one high-country man from names submitted by the High Country Committee to each land board as seats were vacated.⁹

Legislating Rehabilitation: The Land Act of 1948

Legislative advances in the 1940s and 1950s provided the administrative framework for rehabilitation through such acts as the Soil Conservation and Rivers Control Act of 1941 (creating catchment boards) and the Rabbits Act of 1955. The key piece of legislation, the 1948 Land Act, created the current system of pastoral lease tenure for Crown land, the terms of which determine high-country land use and figure heavily in runholders' claims to security of tenure. The minister of lands introduced the act, saying: “It may be necessary for some control to be exercised over the type of land contained in the lease for soil conservation purposes to prevent erosion and regenerate some of the hill country contained in the lease” (in Kerr 1982:4). The tussock grasslands were at a low point, and public concern for soil conservation shaped the Crown's reluctance to allow for the permanent alienation of the high country; even fertile lowlands were seen as threatened by high-country erosion (see Cumberland 1981 for a geographer's view).

The act replaced pastoral licenses with leases that confer the following rights and obligations on lessees: a lease perpetually renewable at thirty-three-year intervals with “fair annual rent” fixed by the Land Settlement Board,¹⁰ “set at a rate per 1000 stock units of unimproved carrying capacity—adjusted for location, stock performance, and other ‘special factors’ ” (Kerr 1984:26); the exclusive right to pasturage over the land comprised by the lease but with no right to soil and water, trees (and shrubs), wild or introduced animals and scenery, and no right of freehold; de facto trespass control; restrictions on stock numbers, burning of vegetation, and cultivation, cropping, and grassing of land, with stock numbers and adjustment of boundaries subject to the permission of the commissioner of Crown lands (New Zealand Government 1948: section 99). The act was supplemented by provisions for control of rabbits, adoption of improved technology and management, and the availability of finance, mainly from the reinvestment of farm income (Kerr 1984:25).

The legislation gave security of tenure to land classified by the Land Settlement Board “as being land suitable or adaptable for pastoral purposes only” (New Zealand Government 1948: section 51.1) and facilitated rehabilitation of the high country (Kerr 1987:3) by providing “occupiers with the confidence to invest in long-term management strategies” (South Island Working Party on Sustainable Land Management 1994:84).¹¹ Insecurity of tenure has often been cited by high-country lessees as the source of environmental deterioration.¹² In *Spirit of the High Country* lessees note that the Land Act provided both “a real sense of ownership” and a “conservation ethos” (South Island High Country Committee of Federated Farmers 1992:19), but the authors of *Pastoral High Country* argue instead that the scapegoating of insecurity of tenure became part of high-country mythology (Centre for Resource Management 1983:40), and pastoral scientists Douglas and Allan agree, acknowledging that economic conditions, limitations of technology, and overgrazing were more critical (1992:13). Following the Land Act, “the history of the hill and high country . . . has been one of dramatic improvement of vegetation, rising stock numbers, intensification and diversification” (Centre for Resource Management 1983:48). Prices peaked during the Korean wool boom in 1950–1951 but were undermined by a waterside workers strike in 1951 that stopped the sale of wool. Run management for soil conservation purposes promoted development of pastoral runs in the 1960s (Centre for Resource Management 1983:49); lowland development by runholders through top dressing was subsidized in return for retirement from grazing of pastoral leases on severely eroded mountain ranges, especially class 7 and class 8 high country; this measure was accompanied by careful control of animal stocking and by noxious weed and animal control.

A marked shift from extensive grazing to rotational grazing and greater subdivision of blocks improved productivity and marks an organically based understanding of land management. Despite a focus in New Zealand on soil conservation and grasslands ecology at this time, productivity remained the primary goal and led to the development and intensification of production and use in the land-development movement of the 1950s, 1960s, and 1970s through aerial oversowing and fertilization (Isern 1992). Farmers told me that subsidies also promoted production and quantity well into the 1980s and in so doing shaped people's images of high-country farmers for the worse.¹³

Freeholding Farmland and Protecting Multiple-Use Lands

In 1970 rent was made reviewable every eleven years but only after the thirty-three-year leases had run their course. Because the thirty-three-year leases would be due for renewal in the early 1980s, the Land Settlement Board and the lessees began to consider the basis for establishing a "fair annual rent." The Land Amendment Act of 1979 switched to a valuation-based rental system, with the rental rate for pastoral leases at 2¼ percent of the value of land exclusive of improvements (LEI) with a two-step phase-in period (see Kerr 1982:4).¹⁴ In 1981 lessees, concerned about the impact of revised rentals based on the value of land, persuaded the government to set up a Committee of Inquiry into Crown Pastoral Leases (Kerr 1984:27). The "Clayton Committee" recommended phasing out pastoral leasehold tenure by reclassifying suitable land as farmland and "establishing a tenure called 'multiple use' land for areas within pastoral leases which, in the public interest, ought not to be permanently alienated" (in *ibid.*:27). Many who claim to protect the public interest believed that the thirty-three-year lease term had made runholders the beneficiaries of highly concessional rentals, but they also believed that eleven-year intervals were still too long given rapid inflation. Many argued that the committee protected the pastoralists' interests above the public interest; runholders, however, noted with distress that their input had not been sought.

The Land Settlement Board did not endorse the Clayton Committee recommendations but, in a series of resolutions put forward to the minister of lands in April 1983, preferred "(a) the retention of the existing form of pastoral lease, (b) the facilitation of partial reclassification of suitable land within leases, and (c) the protection of conservation and recreational values of significance" (Land Settlement Board 1983, quoted in Kerr 1984:27). Kerr notes the practical effects of these recommendations, including the gradual reclassification and freeholding (on the lessees' initiative) of at least part of

most leases; the covenanting of land by the Crown for conservation, recreation, or other purposes; and continued restricted tenure for pastoral use of land not reclassified or covenanted (*ibid.*:27). Freehold title would only be available “in a manner which does not compromise identified conservation or recreational values of significance” (in McSweeney 1983:53).

The initiatives for recalculating the basis for rents on leases to force farmers to freehold particular lands within their leases and for reclassifying the pastoral high country during the 1970s elaborated the distinction between farming land designated for production, which was proposed for freeholding, and conservation land designated for preservation. Farming land fit an earlier model of sustainability in which economic production based on a model of extraction of resources (i.e., soil) took primacy, while conservation land fit an evolving model of sustainability in which environmental preservation based on a model of ecological balance (i.e., species) took primacy. Legislating new classifications that fixed the distinction between productive freehold land and multiple-use conservation land promised to carve up the landscape into categories defined in terms of different uses and value, and in terms of simultaneously competing discourses of sustainability. Government restructuring of the administrative mechanisms for owning and managing high-country lands has been ongoing through the 1980s and 1990s and has reified these distinctions. The protection of natural and recreational values has replaced productivity on the national agenda.

Contemporary Legislative Initiatives: Conservation and Ecological Sustainability

For two decades, and especially throughout the period of my fieldwork, the high country has been a highly contested zone in a rapidly changing New Zealand political arena. Total high-country lands comprise 6 million hectares or 22 percent of New Zealand's land area of 27 million hectares. Of this, in 1994, 2.45 million hectares of land (tussock grasslands, peaks, glaciers, rivers, lakes, and some native forests)—approximately 48 percent of the South Island high country, 20 percent of the South Island, and 10 percent of New Zealand's total land area—were held as Crown pastoral leases in the South Island, with a total of 341 pastoral leases carrying approximately 2.8 million stock units. The balance of Crown land is 3.5 million hectares, consisting of the Department of Conservation estate and national parks (data from Commissioner of Crown Lands 1994:10; South Island High Country Committee of Federated Farmers 1992:2).

My initial fieldwork in 1986, 1987, and 1988 overlapped with the period of radical reorganization by the Labour government in the management of

pastoral lands;¹⁵ new institutional arrangements were part of a new approach in economic policy, environmental policy, and public-sector restructuring (Hayward 1987:41). Key players during my fieldwork include government departments in the Ministry of the Environment and the Ministry of Agriculture, the Public Lands Coalition of conservationists lobbying to retire leasehold land, and recreationists urging open access; the South Island Ngai Tahu, who brought claims before the Waitangi Tribunal against the Crown for compensation in pastoral leasehold lands; and the runholders who lease the pastoral high country from the Crown. Other processes included ongoing land-legislation reform, the privatization of state-owned enterprises begun in 1987 under the Labour government,¹⁶ and an economic downturn in agriculture.

Conservationist Gerry McSweeney and soil scientist Les Molloy note that tussock grasslands contain “a unique group of plants and animals adapted to temperature extremes, drought, heavy snowfalls, fire and even to erosion of the unstable mountain ranges” that have little environmental protection (McSweeney and Molloy 1984:2). They are concerned about the threat to these grasslands posed by pressures from agricultural development and freeholding, as well as pressures from hydroelectric development, irrigation development, exotic forestry, tourist villages, and ski areas (*ibid.*:3). While high-altitude lands have been protected through retirement programs, low-altitude tussock grasslands and high-country wetlands remain at risk, they argue. McSweeney and Molloy note that pastoral lease administration has focused primarily on farming, rather than on the protection of natural and recreational values; they urge the securing of reserves in tussock grasslands and share the view of nonfarming constituencies with concern for the public interest in the high country that the Land Settlement Board “overwhelmingly reflects the political, departmental and farming interests on it” (*ibid.*:3; cf. Centre for Resource Management 1983).¹⁷ In their view, the election of the fourth Labour government in 1984 reflected Labour sympathies for the public interest. Within the Ministry of the Environment, Landcorp (Land Corporation) and the Department of Conservation, together with the Land Department and the Department of Survey and Land Information (derived from the former Department of Lands and Survey), are concerned with pastoral leases (see figure 1 in South Island High Country Committee of Federated Farmers 1987:2). From the perspective of groups such as the Federated Mountain Clubs, this division of responsibility was an improvement over administration by the Department of Lands and Survey, and the Land Settlement Board, with their presumed pastoral bias (see Henson 1986:24). It suggests a shift from a preference for pastoral use of these lands to an accounting of a diversity of values and uses (Hayward 1987:43).

Protecting the Public Estate and the Fourth Labour Government

In September 1986 the cabinet decided to implement a partnership between Landcorp and the Department of Conservation, with the former responsible for commercial farming and land-management operations, and the latter for the identification and protection of conservation values in high-country lands. This separation maps onto that between production and conservation. Pastoral leases and licenses were to be administered by Landcorp together with a number of farms and unalienated Crown land, but the leases remained under Crown ownership, with the corporation serving as agent. As the branch of the Ministry of Environment that deals with planning and policy advice and the monitoring of the environmental effects of policies, the Department of Conservation's main role is nature conservancy, including both a management and an advocacy role "looking after the public interest in the public estate for the intrinsic values of that estate, to allow the appreciation of the estate, to permit recreation on it and to safeguard the future options regarding it" (Woollaston 1987:53).

Parliamentary Under-Secretary for Conservation Woollaston emphasized that the separation of conservation and preservation objectives from production objectives underpinned the establishment of the Department of Conservation and noted that the intensity of feeling surrounding the administration of high-country lands is over production versus conservation values (1987:51):

The debate from the public's perception became one that involved not just the use of or access to public lands; it also became a debate about the preservation of a valuable part of our national self image, our national identity. I don't want to suggest though, that only those that live in towns and look through their centrally heated windows at the Southern Alps have any sort of emotional attachment to that land. Those involved in production from that land identify just as strongly with it collectively and I think much more strongly as individuals. They become, in a good sense of the word, very possessive of the land. I think the symptom of this has been the increasing identification of Crown lessees as "owners" of their farms and the land they lease. (Ibid.:52)

For precisely these reasons, the High Country Committee was distressed by the division of production from conservation. Referring back to the 1948 Land Act, High Country Committee chair Hamish Ensor noted that "this was plainly a recognition of the fact that, within that line, production and pro-

tection should go hand in hand to the benefit of the nation" (1987:69). Ensor's concerns were shared by Chris Kerr, a management officer of the Tussock Grasslands and Mountain Lands Institute at Lincoln University, who noted that "land protection, land management and soil conservation are indistinguishable" (Kerr 1987:8); in either case, at stake are soil, water, and vegetation, all of which former land-tenure legislation (such as the Land Act of 1948) was designed to protect (ibid.:5).

Even more distressing to runholders was the uncertainty of negotiations over marginal strips along streams and rivers, plant and animal pest control, and the Protected Natural Areas (PNA) program. Riparian strips three meters or more in average width were understood by the government to be excluded from transfer to state-owned enterprises such as Landcorp. Provisions in the State-Owned Enterprises Bill (section 24.2b) and the Conservation Act (section 64.4) dictated the exclusion, presumably to provide public access or for the protection of river banks and water quality. The government in 1987 indicated that it planned to eliminate taxpayer funding for the control of weeds and pests, but runholders could not carry the burden of this control, which totals NZ\$15 to \$25 million per year;¹⁸ one runholder, for example, is currently spending 12 to 25 percent of his gross income on such control. Local and regional pest-control authorities with a separate authority focusing on national pest problems seemed likely (Kerr 1987:2).

The PNA program, established in 1982, was meant to "identify and protect representative examples of the full range of indigenous biological and landscape features in New Zealand, and thus maintain the distinctive New Zealand character of the country" (South Island Working Party on Sustainable Land Management 1994:63). Here aesthetics become an integral part of what is sustainable. Teams were to identify these sites, which would then be managed through a voluntary arrangement between the Department of Conservation and the lessee. The PNA program was implemented slowly with no completion date targeted and a presumed shortage of funds; many farmers had moratoria placed on lands with potential PNA designation, removing that land from farming use and complicating their ability to plan or sell leases. As one runholder noted, "Protected areas should be everyone's asset, not the farmer's liability alone." A danger of PNAs for runholders is that they can increase tourism, leading to potential disruption of stock management and increased land degradation from human use.

Similar in purpose to the PNA is the Queen Elizabeth II National Trust, which protects landscape features on private land by accepting gifted or bequeathed land and by open space covenants. Established by act of Parliament in 1977, the trust provides, protects, and enhances open space, defined as "any area of land or body of water that serves to preserve or to facilitate

the preservation of any landscape of aesthetic, cultural, recreational, scenic or social interest or value" (cited in Clendon 1988:23). The National Trust is of special interest to leaseholders because it is "able to provide a legally binding means of protecting special landscape features, in perpetuity and independent of government or commercial interests" (ibid.:23). The trust usually assists with fencing expenses and with legal and survey costs incurred in registering a covenant agreement on a land title. At stake then "in the evolution of balanced high country land management" are both nature conservation and agricultural development (McSweeney 1983:54). By 1994 Gerry McSweeney was claiming nature conservation as "our only sustainable land use" because "a young nation such as ours draws on natural icons to establish our identity," trade and tourism depend "on our clean green image," and nature tourism sells "active experiences" to visitors (not of the "thrill and kill" kind) (1994:58–62).

An additional player with an interest in the public estate is the recreationist, whose voice is heard most loudly through Federated Mountain Clubs. While arguing that the pastoral lease system was fairly effective when it first evolved, the spokespeople for such groups, such as David Henson, say that current changes in land use demand changes in land tenure. They favor more surrender of high-country lands to the Crown rather than retirement, where lands remain ungrazed but within the lease. They favor access to class 7e (severely eroded class 7 lands) and class 8 lands also but claim that run-holders argue over these classifications. An equally powerful spokesman is University of Otago botanist Alan Mark of the Royal Forest and Bird Protection Society (Mark 1985). He argues that the classification "pastoral" is meant to apply to land with clear agricultural value and no recreational value; national values are embedded in high-country lands, and these values must be met first by fully assessing the public interest in these lands. He, too, favors the surrender and compulsory destocking of class 7e and 8 lands if necessary, though he acknowledges that this practice might leave uneconomic those runs for which these lands occupy a large percentage, noting that the idea "gets the backs of farmers up" (Alan Mark, pers. com., 15 June 1987).

Legislating Sustainable Management: The Crown Pastoral Land Bill of 1995

In reviewing pastoral lease tenure, the 1994 "South Island High Country Review" (the Martin Report) maintained that it "is not achieving sustainable management and does not provide the flexibility to make the necessary changes towards ecological sustainability and economic viability"; the report called for a review of pastoral lease tenure and aimed to make freehold "all

land not required by the Crown for the public interest” (New Zealand Minister of Lands 1995:4). Of the four objectives outlined by the report—promoting sustainable land management; transferring the state’s productive assets to the private sector; protecting the public interest in nature conservation, recreation, access, landscape, and cultural and historic values; and considering the Treaty of Waitangi—I will focus on those concerning sustainable land management and freeholding.

The Resource Management Act of 1991 defines sustainable management and subjects all land regardless of land tenure to management constraints ensuring sustainability of “natural and physical resources.” Section II.5.2 of the act reads:

In this Act, “sustainable management” means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well being and for their health and safety while—

- (a) Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
- (b) Safeguarding the life-supporting capacity of air, water, soil and ecosystems; and
- (c) Avoiding, remedying, or mitigating any adverse effects of activities on the environment.

The act refers to matters of national importance such as preservation of coastal features, protection of outstanding features and landscapes, protection of habitats for indigenous vegetation and fauna, preservation of public access to shorelands, and the relationship of *te iwi Maori* with their *taonga*.

Reinforcing the Resource Management Act, Minister of Lands Dennis Marshall sought to address land degradation, specifically evident in the encroachment of weeds, pests, reduced productivity, reduced profitability, and reduced capacity to maintain inputs; to “clarify accountabilities for the condition of land and to create incentives for sound land use practices” in part by making certain parcels freehold in order to increase incentives for farmers to adopt sustainable land-management practices; and to increase the resilience of land by freeing it from the lack of diversification that pastoral leases ensure (Marshall 1995:5). Marshall worked on the Crown Pastoral Land Bill of 1995 to bring about land-reform policy that ranged in its considerations from increased freeholding to the government’s taking back pastoral leases

altogether. He built on prior reviews of the tenure regime and, in particular, came to favor a "land categorisation proposal" creating three categories of land: "farm" land for freeholding, "restricted use" land retained by the Crown and managed under lease for a range of both production and protection purposes, and "conservation" land to be placed in the Conservation Estate (New Zealand Minister of Lands 1995:3).

The bill outlines the procedure for seeking tenure review in which a runholder can initiate purchase. The Martin Report, after scrutinizing pastoral lease tenure and noting that lessees are reasonably content with the status quo, urged that tenure review progress rapidly precisely because it provides a strategy for improving sustainable management in the high country (South Island Working Party on Sustainable Land Management 1994:87). Ecological sustainability, as defined by the Resource Management Act, is said to take top priority in these negotiations. As runholders understood this, it meant that all leasehold land is "up for grabs since it will begin on a level playing field," that classification is gone (for example, class 7e and class 8 land), and that the central issue is the method by which the price is set for freeholding. As one runholder said to me: "No farmer in his right mind is going to trade in a 2 percent rent for a 10 percent mortgage," but the Crown "wants to work this out because it is costing them money" (field notes, 6 May 1995).

One runholder had initiated this process on an interim basis pending review of the Crown Pastoral Land Bill. Two issues emerged in the early stages of the review: public access and the valuation of what might be sold. The family noted that they were undergoing the review process not to gain freehold, but rather "we are in this to resolve issues about the RAPs [Recommended Areas of Protection] and the uncertainty that the Department of Conservation has imposed on us."¹⁹ With the "RAPs on hold," the runholder said, he wanted them "to make up their minds." The family was told it was critical for them to specify what they wanted out of the tenure-review process; they were told repeatedly that they should be no worse off at the end of the day in either financial or productive terms. While I was there, the lessee consulted with the Ngai Tahu to see what kinds of specific demands on these lands the tribe might make with the Crown; their representative had no specific demands and acknowledged that even if burial sites were present, they would best remain undisturbed by being unacknowledged. Like the lessees, the Ngai Tahu representative did not feel that all land should be open by right to a public. Similarly, Tipene O'Regan, chairman of the Ngai Tahu Trust Board, does not trust public ownership. He cuts through the "kiwi taste" for the destructive absolutist "ideological landslides" that have dominated tenure reform in recent years and aligns his position with the farming community: "It's one of the reasons why I like high country field

days, and why I like dealing with people who really do work the land, rather than sitting around and philosophizing about it" (O'Regan 1994:63). O'Regan characterizes the Eastern Polynesian people who came to New Zealand as "habitual interventionists with the environment" and says that their production ethic worked in an environment that was rapidly self-healing. Over time, he suggests, when they became Maori, they were "forced into a relationship with their environment based on sustainability." Sustainability, he argues, is "not really as a concept preservation of a resource. That is, preservation for preservation's sake. . . . It is the preservation for use. It is conserving and caring for them for use." Conservation, then, is "wise use and protection of the reproductive capacity of the resource" (ibid.:64–65).

Members of the High Country Branch of Federated Farmers met in Timaru on 15 May 1995 to discuss the Crown Pastoral Land Bill on its way to a Select Committee.²⁰ The runholders were generally supportive of the bill, but three clauses received their attention. Clause 20 aims "to promote the sustainable management of reviewable land" and to facilitate "(1) the restoration to full Crown ownership and control of reviewable land that has high inherent values; and (2) the freehold disposal of reviewable land capable of productive use; and (3) the creation of appropriate public rights of access to and enjoyment of reviewable land." Runholders noted that the bill does not define "productive use" and does not specify what "the enjoyment" of lands might mean. "Inherent values," after much discussion, was glossed as meaning (natural and physical) conservation values, and the discussion turned to consideration of compensation, with the suggestion to add a clause reading "where a determination adversely affects sustainable management, the financial loss will be equated" (field notes, 15 May 1995).

As was often the case in such meetings, I was asked to contribute, and I risked suggesting that the high-country community might write in the collective self as part of inherent cultural values. During a field day on sustainability at Mt. Peel station, consultant John Tavendale mapped out the following mission statement for the property and its owners since 1855, the Acland family: "To manage the property in an optimum Physical and Financial manner with financial returns not to have precedence over good standards of improvements, sustainable pasture management, yet ensuring that the property will continue to be farmed by the Acland Family" (New Zealand Conference on Sustainable Land Management 1994a:49). Sustainable ownership as a resource is critically at stake in this statement. Clearly these are not the cultural values intended by the legislation. The Martin Report differentiates three kinds of resource values, all of which are designated as economic—use values (benefits derived by society in either an active or passive way), option values (preserving options for future use), and exist-

ence values (values held by people willing to pay to keep things in existence) (South Island Working Party on Sustainable Land Management 1994:12). The report gives primacy to yet another value, primary or intrinsic: the basic ecological characteristics of systems that are the “‘glue’ that holds everything together” in such a way that the value of the ecosystem “will exceed the sum of the [economic] values” (ibid.:12). The concept is akin to Kroeber’s understanding of culture as superorganic, except that ecology has replaced culture.

Clause 14 of the bill, “Discretionary Actions,” authorizes the commissioner of Crown lands, when considering tenure-review applications from lessees, to have regard for “ensuring (so far as is practicable) the protection of the inherent values (other than recreation values) of the land.” As the New Zealand Minister of Lands explains (1995:17–18), the commissioner can take into account not only soil conservation values but also “nature conservation, landscape, historical and cultural values.” Historical and cultural values receive no elaboration in his proposals, however. Some farmers were concerned that this clause “can stuff up a run—production will not win out over conservation.”

Clause 31 was considered the most important, because it empowered “the imposition on land being disposed of of covenants intended to ensure sustainable management” (New Zealand Minister of Lands 1995:iv in explanatory notes). Runholders read this clause as a blank check to the commissioner regarding covenants but noted also that it extended the categories of land that could be freeholded and would elicit opposition from nongovernmental organizations (NGOs).

Shared by Ngai Tahu and the runholders is a diachronic integrative, interactive model of their relations to environmental processes in which sustainability is “an outcome of systemic processes that link people to one another within a community, to their natural environment, and to other communities” (see the article by Lieber in this volume). As Lieber underscores, what is to be sustained is a particular kind of relationship between a population and an environment; here (and throughout the Pacific) social relationships are at stake and land is a template for the familial. In contrast, urban-based environmentalists and NGOs argue for preservation of a presumed static past.

Sustaining Aesthetic Landscapes: Preserving Open Space

NGO opponents of the Land Bill, who also seek to return high-country lands to an undegraded state, vigorously oppose the freeholding it suggests. Just as the profoundly modified British moorlands (also burnt and grazed) seem to

have exerted a spell on Marion Shoard's protection advocates (1982:57), so does the New Zealand high country exert a similar spell for some, that is, as a site for discovering wilderness.²¹ Shoard argues that people are not only herd animals but also loners, hence the desire of the wilderness lobby for the open space of the moorlands (ibid.:58). She extrapolates seven components of wilderness: wildness (the antithesis of domestication), openness (its emptiness and the dominance of the sky), asymmetry and homogeneity (simplicity with no obvious pattern, silence, and solitude), height (demanding physical exertion), freedom to wander at will (liberation and tracklessness), the absence of human handiwork (an "appearance" of being untouched by humans), relics of ancient man (historical monuments), and wind (ibid.: 59–60).

Similarly, a rebel high-country daughter argues not for the sustainability of resources but for the sustainability of landscape—of expansive and solitudinous tussock grasslands, and of an open-space aesthetic (cf. Norton 1991: 16). Lesley Shand, an active conservationist in the Royal Forest and Bird Protection Society, celebrates openness, homogeneity, nakedness, and wilderness (as domesticity's converse):

The real issue of the high country rarely gets aired, yet drives the passion which fires people who know the back country and understand it. . . . It was summed by Bernie Card, once Field Officer in Lands and Survey and then the head equivalent in Landcorp, with what he said to me after the Awatere Valley hearing part of the Clayton Report—"Landscape." I agree with him that landscape incorporates many things. The real threat we face is the loss of those *inimitable, irreplaceable landscapes*—great distances, sweeping vistas and with them goes the natural vegetation, space and the feeling you are seeing a living massive 3D oil canvas—but it's *real*. Those vast distances uncluttered by buildings and in the most part without outward vestiges of colonisation—introduced trees.

I am talking of low altitudes in the high country, where else in lowland areas can you find such untampered with space. The Land Bill commodifies and turns the high country into real estate, and allows the landscape to be chopped into blocks. Smaller blocks are what domesticated humans used to town sections can cope with mentally. They cannot cope with the open space. It's unmanageable in their eyes so it's turned into tidy little blocks of domesticity.

People's imaginations must instead be fired by the concept of OPEN SPACE. That to me would be the greatest loss of all—imposing [the] clutter of domesticity on a landscape so beautiful in its naked-

ness. You really see the form of the country. The underlying geologic forms that are the coat hanger of the present landscape are there for the wondering at. You can imagine and speculate about the great forces that created those forms. I dread the thought of clutter for it.

The high country will lose its inscrutability.

(Lesley Shand, pers. com., 12 May 1995)

The pamphlet to which Shand refers, produced by the High Country Public Lands Campaign in May 1995,²² is a call to arms to save the high country from a "sell-off" by "killing" Marshall's Land Bill and by blocking privatization and permanent alienation through "unconstrained freeholding" of "hundreds of thousand of hectares of the high country now owned by all New Zealanders" (High Country Public Lands Campaign 1995:1). Federated Mountain Clubs has referred to the Land Bill as "The Last Great Public Land Carve Up" (Barr 1994:26). Arguing that covenants are insufficient, the pamphlet says that the bill "marginalises conservation" and fails to protect the high country's "remaining indigenous character . . . from continued burning, grazing and farming use." It "fences nature into a corner" by allowing only areas of (arguably) "high inherent" conservation value to be allocated to the Department of Conservation and thus neglecting "large wild-land areas important for ecosystem protection and recreation" that should be part of the public conservation estate. For the coalition, the Land Bill's major purpose should be to "safeguard nature conservation, landscape, public access and other Crown interests," and the responsibility of the commissioner of Crown lands is to "protect natural character and indigenous vegetation and wildlife habitat" (High Country Public Lands Campaign 1995). Sustainable in these terms is the presumed continuity of the past, continuous with an indigenous, timeless landscape to which New Zealanders have access, which section 2 of the Conservation Act of 1987 attempts to define: "Conservation means the preservation and protection of natural and historic resources for the purpose of maintaining their *intrinsic* values, providing for their appreciation and recreational enjoyment by the public, and safeguarding the options of future generations" (emphasis added).²³

Of primary value for sustainability is a particular kind of heritage, identified by the Royal Forest and Bird Protection Society as the land forms, vegetation, and wildlife of the high country that are unique and distinctive, that is, endemic to the place. At stake with the proposed privatization is the protection (sustaining) of "the mountains and tussock lands, sweeping valleys and dramatic landscapes of this region" (Royal Forest and Bird Protection Society of New Zealand 1995). Like Lesley Shand the society seeks to take advan-

tage of a naturalized historic moment when conservationists might preserve an unbounded visual landscape, like the British moorlands, in which a "network of extensive parks and reserves to protect the natural areas" might be created (*ibid.*). "Outstanding wildlands" comprise this unbounded landscape, the components of which are areas of recreational significance, "the Southern Lakes," "the rolling tussocklands of the Lindis Pass area, the mountainscapes of the McKenzie Country, and the vast braided rivers and gorges of the Rangitata and Rakaia, Waimakariri and Clarence Rivers" (Barr 1994:26).

Cultural Diversity and Community Sustainability

Legislating sustainable land management has taken a new twist in the 1990s. Such legislation is necessary, according to Australian lawyer John Bradsen, because without it the two sets of forces illustrated above will prevail: material forces (economics) and nonmaterial forces (values, attitudes, and beliefs) (1994:100). Bradsen argues that the former force sidelines ecological systems, ignores land as part of nature, and lacks a sense of the community (as distinct from individuals), while the latter is full of contradictions, inconsistencies, and wishful thinking. Bradsen suggests on the basis of models in South Australia that the best legislative models empower, organize, and guide communities (*ibid.*:102). Community has become the third force in the sustainability equation as community-based collaborative models of ownership emerge.

In New Zealand the Rabbit and Land Management Programme provides such a model and has established the prototype for future initiatives. Established for the period 1989–1995 and funded with NZ\$25 million from the central government, the regional councils of Marlborough and Canterbury, and farmers from these areas, the program was a comprehensive response to pest and noxious weed devastation with its goal "to achieve ecological, economic and community sustainability in the dry tussock grasslands." Involved were farm families in the program area, the Ministry of Agriculture and Fisheries, and an advisory committee made up of those with direct involvement in the high country; four hundred thousand hectares of land were involved, including ninety-eight farms with especially badly rabbit-infested lands. The program responded to the nexus of problems created by rabbit and hawkweed infestation, the stresses of a highly variable climate, and the declining financial viability of high-country farming. It focused on rabbit control (through poisoning, shooting, and fencing), "whole farm" plans (with a focus on property plans and good land management), and semi-arid lands research involving collaboration between landholders and researchers in a variety of organizations (Rabbit and Land Management Programme 1988).²⁴

Reminiscent of Leopold's definition of the land ethic as a "community instinct in-the-making," Bradsen's view is entirely compatible with the international goals of the Mountain Agenda for developing approaches to sustainability that "empower mountain communities to exercise more control over local resource management and conservation" and to recover and foster "the cultural expressions of mountain peoples" whose cultural diversity provides a basis for sustainability (Mountain Institute 1996:13). The not-so-extraordinary parallel between cultural diversity and biodiversity, between community sustainability and ecological sustainability (and, as I will argue, between cultural identity and a sense of place, and between human body and the land) prompts us as anthropologists to imagine how we might find a way to enter these dialogues on sustainability by factoring human communities into biodiversity. For example, Mike Evans (this volume) talks about social and cultural practices that bind people together in a transnational context and on which the integrity and sustainability of Tongan identity depends.

My approach is shaped by Robert Netting, who homeostatically jump-started political ecology in his *Balancing on an Alp*, where he attended to the conditions of land tenure, the distribution of land, and its economic significance as social and cultural facts "grounded in history and perpetuated by custom and law" (Netting 1981:14; see Lieber, this volume, for another longitudinal analysis). In taking these components into account along with environmental possibilities and the specificity of subsistence systems, Netting conceptualized the social world as part of the ecological arena and directed attention to the significance of land regulation (as well as intensification and expansion) in shaping the allocation of certain resources (1981:40, 42). For smallholders some kinds of resources lend themselves to communal management (Netting 1993:173). In the Swiss Alps, where Netting worked, communal land tenure was essential to smallholders' management of land in a profoundly modified environment; while ranchers and pastoralists are not smallholders in Netting's terms (*ibid.*:3), the less-modified New Zealand Alps may similarly continue to benefit from a form of communal land tenure and management.

Comparative cultural ecology, environmental historian Donald Worster suggests, invites people to look at the landscape (for example, an instrumentalized river and its social consequences) in order to see "the interplay between humans and nature and to track the social consequences it has produced—to discover the process by which in the remaking of nature, we remake ourselves" (1992:63). Worster asks not if human beings dominate nature, but which humans dominate nature. If the sustainable land ethic rejects individuality and individual ownership and management of resources in favor of Crown ownership and management to preserve the public estate,

it might recraft community, too, not by compartmentalizing land into categories of freehold and Crown land (or categories of production and conservation), but by imagining a different kind of communal ownership—characteristic of but distinct from European alpine tenure patterns—at the district or regional level.

Taking Ownership of Sustainability

The most vocal voices for freeholding in the high-country community argue from a systems-based approach to sustainability in a farming or land-management system. Here the interaction among indicators of sustainability provides the measurable components into which sustainability breaks down: financial (profit, risk, and capital), social (employment, knowledge base, community effects, and values), and ecological (soil, water, and ecological quality and nonrenewable resource use). These indicators are aspects of a range of sustainable land uses including conservation, pastoralism, forestry, and commercial recreation. Fusing conservation and diversified production in sustainable land management is said to be achievable through processes of local ownership, meaning ownership of problems and of codes of practice (Ensor 1994:79–80). “Practical pastoralists” will have to join forces with skilled advisors, agencies, financiers, and politicians; secure tenure and assets must be assured; ownership and the preservation of tradition are incentives to long-term planning; financially robust operations should be sustained; biological controls for hieracium species and rabbits should be introduced; and outside interests should be rejected unless people buy the privileges of ownership. Above all, the “pastoral future will depend on farmers’ ability to understand, take ownership and address sustainable land management” (Brown 1994:40). These farmers and the constituencies they represent have adopted an explicitly science-based sustainable land ethic in which “the answer lies in building strong farmer/science/agency partnerships” (Ensor 1994:80).

As a plan of action this approach is entirely consistent with the international Mountain Agenda of wanting to empower mountain communities to “exercise larger control over local resource management and conservation and generate income in sustainable and equitable ways” (Mountain Institute 1996:26). In *Spirit of the High Country* and in “Sustainability in the South Island High Country” (South Island High Country Committee of Federated Farmers 1992, 1994), the high-country community demonstrates the importance of protecting local people’s interests, recognizing their knowledge, and supporting and initiating long-term monitoring of the environmental, economic, and social impacts of their actions. Above all, the agenda calls for local communities to participate in “all decisions that affect their natural

resources" in locally driven programs (Mountain Institute 1996:22). Some see New Zealand as a pioneer: "in this regard New Zealand might get it right—it's small enough and focused enough with the contemporary shifts framing the debate to have the edge on the world in terms of claiming it is clean and green . . . [although] with nitrogen runoff, we might lose that edge." This farmer thinks that the "ultimate measure" of sustainability is in water and runoff (pers. com., 8 May 1995).

The community has been proactive in the face of challenging social, financial, and environmental constraints in recent years. Farmers note that in the 1980s (and before) it was "all production, production with no concern for environmental issues whereas now, environment is the critical factor"; acknowledging that "farming management is not a static option," farmers state that past financial concerns must be replaced with equal attention to ecological and social concerns (New Zealand Conference on Sustainable Land Management 1994a:50). With so many interest groups making claims on these lands, farmers refuse to stand passively by and let others call the shots; in fact they are working to outsmart urban rhetoric by quantifying it. They are developing computer modeling for measuring components of financial, ecological, and social sustainability and for surveying and monitoring vegetation (Aubrey and Ensor 1994).²⁵ The computer model STOCKPOL is used to ensure that specific options for farming are biologically feasible; another computer model, RANGEPACK, calculates and projects economic outcomes (New Zealand Conference on Sustainable Land Management 1994a:56). In the upper Rakaia valley, together with a Landcare group and some funding from the Ministry of Agriculture, farmers are monitoring approximately one hundred species of vegetation in twenty sites per property, examining three to five sites per property per day. They selected a range of sites—with varying altitude and aspect, and including unimproved and improved country as well as back and front country—and worked with a list of salient species such as hawkweed, blue tussock, snow tussock, and sweet vernal. They defined an area one hundred by one hundred meters and drew a line through it to do a species count. Then they entered the data into a computer (graphing it on three axes) to produce a baseline against which to measure change.

An advocate for the Rakaia monitoring project believes that these data will provide definitive evidence against people who argue that areas are degraded by stock. He gave me the example of one hill on his family property that environmentalists declared a tussockland, and he explained to me that they don't realize that it isn't in its natural state—it has tussocks because it is grazed and also has superphosphate applied; with grazing removed, the tussocks wouldn't maintain themselves. An authentic natural state therefore

cannot exist. Other farmers told me that while computers measure what actually is happening physically, management decisions are often made “from the gut,” from intuition, “from an instinct for farming.” Similarly, Stevens (this volume) illustrates that soil fertility analyses match Tongan farmers’ hunches. While “ag-sci types struggle to understand” the computer programs, they “come easily to the farmers who understand intuitively what it is about.” A farmer said that such a program “gives one the vocabulary to notice indigenous vegetation,” thus taking care of “information holes” in their systems. He said that it has provided farmers with an opportunity to learn about what they don’t know rather than to voice what they do know. Another farmer in the Rakaia valley quietly and confidently asserted that the best measure of land degradation is in the condition of his stock (pers. com., 1995). Runholders know that with any property, stock provide the ultimate measure of health.

In 1990 a discourse of sustainability was imposed on the high country as part of an international agenda to manage mountain ecosystems, and farmers, while recognizing the need to embrace actively and to define this top-down concept (to make it theirs), shared their doubts about it with me: “it’s the in term, but it hasn’t been defined,” “what does it mean to be sustainable?” “what is to be sustained?” “for whom is it to be sustained?” In this hermeneutic vacuum they are responding locally to sustainability as the newest colonialist mentality (see Stevens, this volume) and seizing collective agency by pioneering computer software to measure the concept and move it beyond rhetoric. Their actions are about ownership of the concept.

An Indigenous Land Ethic: Sustaining Local Communities

Anthropologist Roger Keesing has shaped a now-influential Pacific literature theorizing cultural identity, emphasizing its fluidity and constructedness, proclaiming the situatedness rather than the inherentness of its authenticities, and helping to jettison threadbare “coral reef” essentialized understandings of culture as accretive, consensual, static, and coherently indigenous; indeed indigeneity is a pastiche (1993). Similarly, an indigenous state of nature is also a pastiche, and “country,” like cultural identity, is as much a construction as an essence. Just as theorists of cultural identity reject a biological model of culture as species (Jackson 1989), so also must theorists of place reject a biological model of a “natural” landscape as having fixed, albeit diverse, inherent features. And yet it is precisely inherent and intrinsic values that clauses 14 and 20 of the 1995 Land Bill and the Conservation Act of 1987 objectify, essentialize, and specify as needing the protection afforded by sustainable land management. At stake in the complex maneuverings to

define sustainable land management are competing ideas about what these values are and which form of cultural landscape in the high country should prevail.

The truth is, as novelist of place Wallace Stegner remarks, “a place is more than half memory” (1994:591), and nostalgia for the way places used to be is a sign that “we have made a tradition out of mourning the passing of things we never had time really to know.” He cites Wendell Berry

and his belief that if you don’t know where you are you don’t know who you are. He is talking about the kind of knowing that involves the senses, the memory, the history of a family or a tribe. He is talking about the knowledge of place that comes from working it in all weathers, making a living from it, suffering from its catastrophes, loving its mornings or evenings or hot noons, valuing it for the profound investment of labor and feeling that you, your parents and grandparents, your all-but-unknown ancestors have put into it. He is talking about the knowing that poets specialize in. (Ibid.)

Stegner’s call is to preserve place by sustaining habitation, not through nostalgia or replication of false authenticities. He tells his readers to be still, to belong, as indeed the current generation of high-country families have sought to do. And he, the poet, provides a formula for the sustainable in his own acentered land ethic: “Only in the act of submission is the sense of place realized and a sustainable relationship between people and earth established” (ibid.). Stegner’s Western land ethic has been under fire from multicultural critics, suggesting that the substitution of “place” or “nature” for “culture” in Jean Jackson’s title “Is There a Way to Talk about Making Culture without Making Enemies?” is an equally risky task when applied to the environment.

Preservation is not straightforward, and knowing what is to be preserved seems to rely on rootedness and realizing that a country of pastoral lands is also a pastiche, like identity. In positing that people treat valued landscapes as “shrines to the past,” David Lowenthal has written that people’s preferences for past over present landscapes derive from “erroneous perceptions” that fail to acknowledge that such pasts (like identities) are complex and fluid accretions of time periods (1982:93). Lowenthal explains why people revisit these valued landscapes in memory—because the past is highly malleable through mental processes of selectivity and imagination, and because we can imagine a false continuity through landscape (and perhaps solitary escape in landscape) that counters the fragmentary nature of our lives. While Lowenthal addresses a primarily visual or representational landscape, rather than land in its more overt physical, geographical sense, his concept of valued landscapes resting in the valorization of a mythical past is equally applicable to

conservationists' concerns for nature resources with high inherent value and to old-fashioned discourses of sustainability with their emphasis on ecological continuity and preservation of an idealized, past balance of self-sustaining resources free of human intervention. Contemporary political, economic, and ecological pressures in the New Zealand high country preclude the continuation of a discourse of landscape and demand a return to treating this terrain on the terms of its managers and owners, the high-country community, for whom this place has been "country," an inhabited site invested with cultural meanings.

One farmer's reflections, although not typical, are provocatively resonant of Stegner's and Lowenthal's situational sense of place. He believes that the world never has been sustainable in its original form because change is essential to its condition (see Lieber, this volume), that sustainability time spans should be lengthened and land use slowed down to a minimum to ensure the same potential for future generations. He urges a return to mulching and fallow lands, both practices that he is experimenting with on his Otago property to control hieracium and rehabilitate the soil. In particular he attacks the profit motive sustained by the ideology of economic growth by urging lower expectations in terms of productivity and by using the horse as a way of returning to and preserving an endangered land ethic that celebrates animal husbandry, the soil, and the local community (Morris 1996: 176–178). Stegner says to be still, to belong; Morris says to follow Stegner's lead. Morris's thoughts, as dated as they may seem—he acknowledges that they may sound crazy—are reflected in the community-based, interactive project of legislating sustainable land management for pastoral lands at present and in community-based, local-level land care groups. His analogy of the land to the human body, similarly (and momentarily) sustained by drugs in the form of fertilizers, gives one pause as it suggests a series of linked analogies paralleling the historical progression from production to conservation to community in land legislation—land : body :: natural/biological diversity : cultural diversity :: country : cultural identity. If the analogy holds and dominant cultural metaphors become ensconced in land-management policies, Bradsen's legislative underpinnings in community and the Mountain Agenda's commitment to the simultaneous preservation of linked biological and cultural diversity may provide New Zealand with the grassroots model for an innovatively progressive sustainable land ethic.

NOTES

This work is based on field research on the dynamics of cultural identity and spatiality in the New Zealand South Island high country. Research has been ongoing since 1986 and has received support from the Wenner-Gren Foundation for Anthropological Research,

Faculty Research and Travel Grants from Bard College, and support from the Cultural Heritage Management Centre of the University of Canberra. Michael Lieber, James Hess, and Charlie Stevens provided helpful suggestions for revision, for which I thank them.

1. See John McPhee 1971 for a philosophical consideration of conflicts and convergences between discourses of conservation, wilderness, development, and hydraulic engineering. See Dominy 1997 for an Australian case study.

2. As a global network, the nongovernmental Mountain Forum is committed to promoting and implementing the Mountain Agenda. The Mountain Forum's webpage can be found at <http://www.mtnforum.org/>. The regional Asia/Pacific Mountain Forum has as its focal point ICIMOD (International Centre for Integrated Mountain Development), with its network on sustainable development of mountain and upland areas of Asia. Its Web site is <http://www.icimod.org.sg/>. See Mountain Institute 1996.

3. Rangelands scientist Kevin O'Connor, in "The Conservation of Nature and Culture in New Zealand Mountains," has defined culture in this instance as "the impact of work on environment by a people acting under the impulse of a continuing tradition," but he understands such culture to be adaptive and creative, not "slavishly mimicking" one's grandparents (1989:99). As he notes, "Continuing culture also requires a continuing environment." In the Australian Alps, the term "cultural heritage" is used instead. For an exploration of parallel issues in the context of the Australian high country in New South Wales and Victoria, see Scougall 1992.

4. Textual data include the Resource Management Act of 1991, the proceedings of the 1994 New Zealand Conference on Sustainable Land Management convened at Lincoln University (1994b), the comprehensive "South Island High Country Review" (called the Martin Report) produced in the same year by the South Island Working Party on Sustainable Land Management, the new Crown Pastoral Land Bill (revising the 1948 Land Act and made into law in 1998), the extensive reports of the Rabbit and Land Management Board, and farmer initiatives in computer modeling such as Project FARMER (the acronym for "Farmer Analysis of Research, Management, and Environmental Resources") of the Rural Futures Trust (Aubrey and Ensor 1994).

5. Commissioned by the ministers of conservation, agriculture, and environment, the "South Island High Country Review" is known as the Martin Report after Graeme Martin, chair of the South Island Working Party on Sustainable Land Management, which authored the report.

6. *Pakeha* refers to New Zealanders of Anglo-Celtic descent.

7. The Tussock Grasslands and Mountain Lands Institute, dissolved in 1988 and replaced in 1993 by the Centre for Mountain Studies, has published extensively on pastoral leasehold land, focusing on tenure, management, and sustainability (see especially its Centre for Resource Management 1983:31–54 for a history of land tenure).

8. In 1983, 369 runs under pastoral lease were distributed among the provinces as follows: Marlborough, 15 with one representative; Canterbury, 155 with three representatives; Otago, 200 with three representatives; and Southland, 25 with one representative. The average run size is 6,850 hectares.

9. Land boards were superseded in 1948, but high-country representation continued on the newly formed Land Settlement Board.

10. A chief pastoral land officer was responsible to the Land Settlement Board, which, in turn, was under the minister and Department of Lands and Survey. The board could reclassify land. Section 167 of the 1948 Land Act gives the minister of lands the right to set aside Crown land as a reserve even if it is subject to a pastoral lease.

11. The implications of the wording are unclear now, although in 1948 it is likely that pastoral use was the only conceivable meaning intended. As Kerr asks (1987:3), "Is it intended that pastoral land be used exclusively for 'pastoral purposes' and thereby exclude all other uses?"

12. Underlying the legislative dependence of scientific resource management of tussock grasslands in New Zealand has been an implicit bias toward the tragedy-of-the-commons model, which tends to assume that the "users are selfish, unrestricted by social norms of the community, and trying to maximize short-term gains" (McCay and Acheson 1987:7). However, as McCay and Acheson also point out, contextual factors must be considered in any attempt to generalize from this model. The argument has worked to the runholders' advantage in securing them the tenure that undermines extractive, unsustainable productivity. See also Netting 1993:185 for a complex reading of the relationship of security of tenure to investment; he writes that "smallholders cannot wittingly destroy their own resources and thereby ruin the future livelihoods of their offspring" (ibid.:333).

13. This kind of ecologically compromising pastoral activity is linked to local intentions realized through global markets as illustrated by Evans, Stevens, and Shankman in this volume.

14. In contrast, in the United States the formula is more complicated and also the subject of bitter debate. "The formula consists of a base value of grazing on public land adjusted by indices reflecting current year land lease rates, cost of production and beef cattle prices. Annual increases or decreases of fees will be limited to no more than a 25% change from the previous year's fee. The fee will not, however, be lower than US\$1.35 per animal unit per month (AUM). AUM is the amount of forage consumed by one cow and one calf, one horse, or given sheep or goats in one month" (in Ensor 1993:20).

15. For timely discussions of recent changes in land administration (pastoral land and administrative reforms), see New Zealand Mountain Lands Institute 1989, Tussock Grasslands and Mountain Lands Institute 1987.

16. See especially *The Fourth Labour Government: Radical Politics in New Zealand*, edited by Boston and Holland (1987).

17. The composition of the Land Settlement Board at the beginning of my fieldwork was minister of lands (chairman); three representatives of the Department of Lands and Survey; one representative each from the Treasury, the Ministry of Agriculture and Fisheries, the Valuation Department, and the Rural Bank; and four private members (all farmers). Alan Mark (professor of botany and advocate for the Royal Forest and Bird Protection Society) and Alan Evans (former Federated Mountain Clubs president) were invited to attend.

18. Earlier Robert Muldoon under the National Party eliminated Tax Payer Input for the same.
19. RAPs were areas created by the preliminary ecological survey work completed as part of the Protected Natural Areas Program and were defined under the Resource Management Act. While some lessees participated in having such areas designated, others did not. Action on RAPs has been suspended.
20. See New Zealand Government 1995 and New Zealand Minister of Lands 1995 for documents under discussion.
21. See also Graber 1976. Graber's "wilderness ethic," distinct from Leopold's garden-based "land ethic," is an urban phenomenon that, she argues, is out of touch with the means of rural livelihoods (ibid.:114).
22. The campaign involves the Royal Forest and Bird Protection Society, Federated Mountain Clubs, the New Zealand Deerstalkers' Association, the New Zealand Fish and Game Council, and Public Access New Zealand.
23. Crown Pastoral Land, 86–1, Interpretation, defines "inherent values" as natural resources (as defined by the Conservation Act of 1987) and recreational, cultural, and historical values (New Zealand Government 1995:2). The runholders referred to such areas as the "Crown jewels."
24. See the *Report of the Rabbit and Land Management Task Force* (Rabbit and Land Management Programme 1988).
25. For example, the Martin Report resists definitive statements but expresses concern for the possible decline of organic matter, nutrient levels, and soil pH (South Island Working Party on Sustainable Land Management 1994:28). In response to the report's conclusions about nutrient imbalance on unimproved country, the South Island High Country Committee of Federated Farmers (1994) provided specific calculations for balancing nutrient losses by artificial inputs.

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ACCOUNTING FOR CHANGE: BRINGING INTERDEPENDENCE INTO DEFINING SUSTAINABILITY

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"Sustainability," the key word of international development bodies currently intervening in the restructuring of the Marshall Islands economy, is defined within Western economic conceptualizations. I argue that such characterizations are incomplete: they fail to capture the full nature of the ongoing Marshallese economy by focusing too narrowly on transfers related to the Compact of Free Association and by their partial understanding of Marshallese food systems and easy dichotomies between imported and local foods. The segregation of external interventions by sector further distorts their possible impact. Structural imbalances within the Marshallese and other Pacific nations' economies have been exacerbated by the ways in which earlier monetary transfers have been made and labeled, and by treating subunits of regional economies as if they were separable from the larger unit of which they have for the past century formed a part. To be useful as an analytical construct, sustainability must be defined at local, national, and international levels within the culturally and politically appropriate terms of what it is considered critical to sustain.

IN THE LATE 1990s there were multiple international, U.S., and national agencies at work in the Republic of the Marshall Islands (RMI) attempting to restructure its economy. At the international level alone the Asian Development Bank funded a specialist to work for a year to develop the agricultural sector; UNICEF continued its Family Food and Nutrition Program; the Asian Development Bank funded a team (of which I was a member in 1996–1997) to write a National Fisheries Development Plan; and the Asian Development Bank, World Bank, and the United States funded a Policy Advisory Team to restructure the government and the entire monetary econ-

omy. The scale of intervention is perhaps indicative of the degree to which the Marshallese economy is considered out of control, in Western terms.

In this article I argue that despite what I perceive to be primarily good intentions and high capabilities of the outside experts and an exceptional willingness on the part of the Marshallese people (grassroots as well as many of its leaders) to recapture workable ways of living in their environment, the separate projects are doomed to failure without an integrated reevaluation of the nature of the current Marshallese economy in the U.S. and global economies. "Sustainability," the key word of all these interventions, must simultaneously be redefined on the local, national, and international levels. More important, such definitions must account for the *actual* economy of the Marshall Islands at this time, an economy *not* of an independent entity, but one that over the past century has become progressively intertwined with international forces.

In the late 1800s and early 1900s, the Marshalls redirected its agricultural production toward copra, a world market commodity, progressively substituting imported rice for breadfruit, taro, and arrowroot as the staple starch food. By the 1980s the entire economy and demography of the Marshall Islands were directed toward its international partner, the United States, its resource environment including U.S. transfers paid for the use of its northern atolls for nuclear testing and the continued alienation of most of Kwajalein Atoll for Star Wars missile tests. Political independence aside (and this was a highly debated topic until the entry of the Marshalls into the United Nations in 1991 rendered the point moot), the Marshallese economy is integrally connected with that of the United States.

Lest readers consider the Marshallese misdirected in their focus on the United States, let me briefly reconsider the United States' current and historical impact on the islands. Readers will know of the atomic bombs tested in the northern atolls between 1947 and 1958. The U.S. Congress recently increased from four to seven the number of "atomic atolls" formally recognized by the United States as severely affected by these tests, a number expected to further expand in this nation of twenty-four inhabited atolls and islands. The United States established substantial financial trust funds for the first four islands so designated and is in the process of funding the atolls just added. These islands operate under a subclause (177) of the Compact of Free Association that governs the formal relationship between the United States and the Marshall Islands during the fifteen-year period from 1986 to 2001.

Nuclear testing, however, is still only part of the continuing relationship of the United States and the Marshall Islands covered by the compact. A separate agreement, with a life span of thirty years (which can be terminated

only by mutual agreement even after that time), covers the continuing U.S. use of Kwajalein Atoll as a missile base. The end of the cold war and global rollback of U.S. military forces has not brought a decline in the U.S. use of Kwajalein: the *Marshall Islands Journal* (1997) reported that the 1997 schedule was the heaviest in years. Housing for U.S. contract personnel was overflowing even to Majuro, an hour's flight away.

It is true that the Compact of Free Association between the Marshalls and the United States is now in its final five-year phase-down period of funding (due to terminate in 2001). Substantial governmental investments in fisheries (purchase of long-line fishing boats) and in transportation and tourism development (the Airline of the Marshall Islands, the former Outrigger Hotel) have not brought an increase in the private sector or in income generation for the government; the economy remains heavily imbalanced toward a public sector supported by U.S. transfers. The government has borrowed heavily against future compact payments to fund these and other investments, and the public sector is itself being substantially trimmed to cut operating costs.

However, restructuring the government with regard to the compact and its schedule of payments is only a part of the Marshallese economic picture. The Marshallese economy at this time, and for at least the next fifteen years, relies on substantial inputs from the outside. In addition to declining U.S. compact transfers and federal program aid to the government, there are continuing quarterly payments made to Kwajalein landowners for the use of their lands for missile testing (recently expanded to include some lands on Aur) as well as the nuclear trusts (a constant subject of controversy) that provide funds to certain populations. Returns from distant water fishing nations for fishing rights within the Marshalls' Exclusive Economic Zone are currently low, but large economic transfers labeled as aid have accompanied the payments that Japan and other distant water fishing nations pay for the rights to harvest tuna from the Marshall Islands Exclusive Economic Zone. In addition, international organizations such as the Asian Development Bank are making long-term low-cost loans available to the Marshalls, shifting current inputs toward transfers made on a loan basis rather than the grants that previously characterized most transfers to the Marshalls.

A Demographic View

The degree to which the Marshallese economy has already been restructured around a U.S. core can be demonstrated by a review of its regional demography (Gorenflo and Levin 1994). This restructuring is not recent: an archaeologist noted "a society in more-or-less rapid transition to a social and economic order congruent with its position in the world market economy"

(Dye 1987:9), based on intensive ethnographic description of such transitions beginning in the early nineteenth century. Recent demographic transformations, however, are extreme. The population increased more than six-fold between 1945 and the present, from 9,471 in 1945 (Gorenflo and Levin 1994:105) to an estimated 59,243 in 1997 (OPS 1996:14). Fully 70 percent of the population resides on the two urbanized atolls of Majuro (29,002) and on Ebeye islet within Kwajalein Atoll (12,813) (*ibid.*:24). In the past the overall population and the size of the Marshallese chiefdoms had been severely limited, most likely primarily by their fragile ecological bases. The coral atolls rise barely above sea level and have small land areas with poor soil, subject to relatively low rainfall. Their agricultural productivity is low, and most atolls supported only their own population with little surplus and frequent periods of famine and food shortage. There were no regional centers supported by surrounding hinterlands.

In stark contrast to traditional regional organization, the entire area currently contains two major centers of population and economic activity. Inhabitants of these centers include thousands of people who have no traditional rights to reside there. The sociocultural foundation for such large-scale regional organization was absent in the traditional Marshall Islands. Even if the basis for a broad redistribution system did exist, the populations concentrated in modern centers have reached levels well in excess of regional support capabilities for any hinterland one cares to define within the Marshall Islands. The centers require substantial support beyond that available locally in order to survive. Such a regional setting could not evolve within a closed system; the basis for this development was provided by other nations, predominantly the United States (Gorenflo and Levin 1994:145–146).

Gorenflo and Levin in their account, unfortunately, move from this perspective of an open regional system based on strong economic links to the United States to considering the Marshalls as a single economic unit. They conclude that the system is therefore unstable, and Gorenflo believes that it is only through a controlled decentralization that the Marshalls could hope to achieve a sustainable, self-reliant system (Gorenflo 1990). Even if decentralization could be achieved, which these authors and I consider doubtful, I argue that sustainability needs to be defined within the larger social and political framework within which the Republic of the Marshall Islands exists. Continued U.S. monetary transfers to the Marshalls are not based on economic principles. Insisting on an economic definition of sustainability belies the continued political and strategic importance of the Marshall Islands to the United States. Regardless of whether compact payments actually cease in 2001, substantial payments will continue to flow into the islands through the Kwajalein missile base and the already established Title 177 trust funds. The Marshallese have literally been banking on it.

Gorenflo and Levin's assumption of the possibility of a return to the outer islands is mirrored in RMI government quarters. Many seem to believe that with 70 percent of the population residing on Majuro and Kwajalein, the outer islands must therefore be depopulated. Thus, as government jobs decline in Majuro, people expect that a number of outer islanders may simply return to their home atolls and thereby reduce population and resource pressures on Majuro and Ebeye. In fact, all atolls and islands have experienced significant population increases between 1958 and 1988 (see Table 1) with the exception of Likiep (owing to the closure of a school) and Ebon (now reversed with the opening of an airstrip). The overall Marshallese population has increased to such a level that one must question the assumption that outer-island resources could support the return of urban dwellers to their home atolls, as these resources have always been fragile, and the series of major typhoons of the early 1990s severely affected food production on most of the atolls.

While the outer islands will experience greater local autonomy and greater responsibility for their populations as the public sector declines, it is not anticipated that the Marshallese people will redistribute themselves back to their pre-1950s homelands even if they are able to. The contractual continuation of the Kwajalein Missile Testing Agreement fifteen years after the term of the present Compact of Free Association in 2001 indicates that Kwajalein will remain a major population center; the concentration of health, education, and other services in Majuro indicate it will retain its importance as well.

The 1994 Multi-Subject Household Survey did indicate a slight trend toward the net return of Marshallese to outer-island communities. Whereas on a lifetime basis there was a net increase of 7,506 who migrated from rural to urban communities as compared to 3,884 moving from urban to rural, within the last year the respective numbers were 441 rural to urban compared to 531 urban to rural, and within the past five years 717 rural to urban compared to 726 urban to rural. These are the net figures; the Marshallese are highly mobile, and the numbers of individuals and families moving would be much higher. It is important to note that in each case half the migrants are young dependents moving with household members (OPS 1996: tables 22–25).

There are significant differences between rural and urban populations in population structures and population densities. In 1988 the center of Majuro Atoll experienced a density of 28,724 persons per square mile; Ebeye had 59,457 persons per square mile. Outer-island populations are skewed toward the young (with a median population aged twelve years) and the elderly, as many of working age have moved to the population centers. This imbalance can be seen by reviewing the dependency ratios shown for 1988

TABLE 1. Population Statistics

Atoll/Island	1958	1973	1988	1958-1988 Change	Median Age, 1988	Dependency Ratio	Percentage under 18 years	No. of Households
Ailinglaplap	1,288	1,100	1,715	427	11	1.76	64.8	200
Ailuk	419	335	488	69	12	1.60	60.5	72
Arno	1,037	1,120	1,656	619	11	1.64	62.6	188
Aur	241	300	438	197	13	1.35	60.5	60
Bikini/Kili	267	435	612	345	14	1.18	53.8	84
Ebon	819	740	741	-78	12	1.79	63.2	90
Enewetak/U	172	342	715	543	13	1.21	56.1	103
Jabat	—	70	112	112	11	1.55	60.7	17
Jaluit	1,098	925	1,709	611	13	1.36	63.1	203
Kwajalein	1,284	5,469	9,311	8,027	14	1.14	56.3	950
Lae	165	154	319	154	11	1.51	62.4	25
Lib	44	98	115	71	13	1.30	56.5	16
Likiep	636	406	482	-154	13	1.50	57.7	71
Majuro	3,415	10,290	19,664	16,249	16	0.99	53.9	2,228
Maloelap	454	432	796	342	12	1.33	59.9	103
Mejit	346	271	445	99	12	1.37	56.9	48
Mili	412	538	854	442	12	1.52	61.7	98
Namodrik	523	431	814	291	11	1.77	64.9	96
Namu	482	493	801	319	12	1.36	60.8	86
Rongelap/M ^a	264	165	—	—	—	—	—	—
Ujae	167	209	448	281	11	1.67	63.8	37
Utirik	198	217	409	211	13	1.48	57.5	53
Wotho	71	61	90	19	13	1.37	56.7	16
Wotje	361	425	646	285	12	1.45	61.8	79
Total	14,163	25,045	43,380	29,217	14	1.17	56.9	4,923

Source: Based on OPS 1989, 1993; Ministry of Interior and Outer Island Affairs 1991.

^a The people of Rongelap were evacuated, mainly to Mejjatto, Kwajalein Atoll.

in Table 1 (based on OPS 1993: table 2.8), which range from low rates of 0.99 and 1.14 for Majuro and Kwajalein, respectively, to the high rates of 1.79, 1.77, and 1.76 for Ebon, Namorik, and Ailinglaplap, respectively. Simply stated, the ratio of dependent children and adults to working-age adults is relatively even on Majuro and Kwajalein, but on the other atolls the rates reach the high on Ebon of nearly 1.8 dependents to each working adult. Another way of thinking about the high dependency ratios is in terms of flows of food and money that family members frequently send from the urban centers to assist kin on the outer islands to care for dependents. In a practical way the economies of the islands are closely interlinked and cannot truly be separated as people, food, and money constantly shift among family groups spatially distributed throughout the urban centers and rural islands, and even to student-oriented communities abroad.

Rethinking the Marshallese Economy

A primary failing of “top-down” development planning is an emphasis on economic (as opposed to social and cultural) factors as they are understood from a Western economic perspective. There have been insufficient attempts to understand the broader socioeconomic systems currently operating in the communities for which development projects have been proposed. Western economic models tend to dichotomize—between monetary and subsistence sectors of the economy, between urban and rural issues, between modernized and traditional activities, between imported and local goods—separating rather than studying the linkages between these components. Most important, agencies may fail to recognize the ways that multiple economic models may be operating simultaneously, differentially inscribed with meaning in their constant linkages between members of rural and urban communities. The problems of such dichotomous models become apparent in the statistical accounts they create, which notably fail to describe the productive activities of fully half the populations of many countries—the women and the youth—simply labeling them as “economically inactive.”

There are then two levels, two vectors, that must be considered in rethinking development from the perspective of the economy. The first refers to the need to make explicit the existence of a plurality of models of the economy. To do so entails placing oneself in the space of local constructions. But this level by itself is inadequate. A second level of concern must be added, involving the mechanisms by which local cultural knowledge and economic resources are appropriated by larger forces (mechanisms such as unequal exchange and surplus extraction between center and periphery, country and city, classes, genders, and ethnic groups) and, conversely, the

ways in which local innovations and gains can be preserved as part of local economic and cultural power. Political economic

theories fall short of the task, especially because they do not deal with the cultural dynamics of the incorporation of local forms by a global system of economic and cultural production. A more adequate political economy must bring to the fore the mediations effected by local cultures on translocal forms of capital. Seen from the local perspective, this means investigating how external forces—capital and modernity, generally speaking—are processed, expressed, and refashioned by local communities. (Escobar 1995:98)

The Marshall Islands presents a striking example of the way Western models and current international aid practices may in fact contribute to structural imbalances within the local economy and may point toward ways to redirect aid programs so that they can assist local communities to reestablish their economies in relationship to the current global economy. Such a redirection requires a rethinking of global-local connections, a recognition of the possibility of multiple economic models operating and interacting, and a study of the cultural dynamics of such processes, as Escobar suggests.

However, the Marshall Islands case also requires a rethinking of Escobar's remodeling of the discourses of development, in that he presumes that the unequal exchange between center and periphery is characterized by surplus extraction from the periphery by the center. But the primary resources extracted from the Marshall Islands by larger forces (i.e., the United States) are strategic in nature, and the economic transfers in fact have flowed largely from the United States to the Marshall Islands (1) as payments for the use of Kwajalein Atoll for missile testing and (2) through the Compact of Free Association between the two nations, established at the termination of the colonial relationship between the two countries. These payments as well as the ways in which they have been distributed have contributed to structural imbalances within the economy. It is the decline of the compact payments that has spurred the current crisis, even though the missile-testing payments continue. Economic models in general have difficulty incorporating factors such as strategic political considerations that result in payments for primarily noneconomic purposes.

A Western Perspective of the Marshallese Economy

The Compact of Free Association, which covers financial arrangements between the United States and the Republic of the Marshall Islands from 1986

to 2001, calls for a three-part step-down of transfer payments. The Marshalls is currently in the last phase of descending payments, and it is in the context of heavy advance borrowings against remaining transfers that a structural readjustment of the Marshallese economy is currently under way.

Beginning in the mid-1960s, when the Marshalls was part of the U.S. Trust Territory of the Pacific Islands, the United States began an accelerated program of funding (following two decades of relative neglect), providing increased health, educational, and social services in Majuro, the administrative center. A second population center developed on Ebeye in response to employment opportunities on the neighboring island of Kwajalein. The United States funded the construction of schools, hospitals and dispensaries, roads, docks, and airports and the development of a local bureaucracy to run the predominantly public-sector services. Such projects and many of the current developments under way in the Marshall Islands, including fisheries projects funded by both the Japanese and international aid agencies, were in the past established on a "need" basis in an attempt to establish a local infrastructure and skills base from which the Marshallese economy could develop. Such projects were not established within the strict economic guidelines of what this small nation could "afford," nor were the projects planned in conjunction with the communities and their existing lifestyles. They did, however, succeed in building up a considerable infrastructure in several of the communities.

At present, international grant funding is drying up, and "sustainability" is a key word in current aid packets that are becoming dominated by loans rather than grants. The term "sustainability" is primarily understood within an economic framework in that projects should be able to demonstrate an ability to be self-generating within a reasonable period of time, while allowing a repayment of the start-up funding. Sustainability is secondarily understood within the framework of whether the indigenous people have relevant management and work skills, or can be quickly so trained. Altogether, sustainability is understood within dominant economic models of costs and benefits.

In these terms the current Marshallese economy is largely dependent on external transfers, primarily from the United States. There are major structural imbalances, with a concentration of economic wealth by the local elites (far surpassing pre-European concentrations), compounded by a rapidly expanding population, 70 percent of which lives in the two urban centers of Majuro and Ebeye. As a result of population pressures on land and lagoon resources, the people subsist primarily on imported foods. The small private sector that exists relies on expenditures from the salaries of an inflated public sector. Prices for foods, particularly local food, are high in the stores. Those

who cannot afford to pay are reduced to purchasing low-cost and less nutritious foods. The future, characterized by decreasing international transfers and substantial layoffs within the public sector, appears bleak.

An Alternate View Incorporating Multiple Economic Systems

The above scenario, focused on Western models of understanding, may be only a partial view of the contemporary situation. There have been a number of indications that Micronesian food systems have greater resilience than anticipated. In 1987 the Palau government laid off over two-thirds of all government workers for several months; contrary to expectations, the economy did not collapse, and people were able to return quickly to farming and fishing, and other available resources. Arguably at least as dependent on the public sector and imported foods as the Marshallese are today, the Palauans were able to rely on existing systems to feed themselves, and in interviews conducted after the crisis not one person mentioned a shortage of food, in marked contrast to their descriptions of the last year of World War II, which revolve around the famine they suffered (Nero 1989, 1993; Burton and Nero 1996). While Palau has a smaller population and larger land resources, nevertheless, the Marshalls could produce more food than it does at this time. Furthermore, statistics are very poor regarding how much is actually produced or harvested but not marketed, in particular with regard to fisheries resources.

When the islands were first incorporated into the global economy in the mid-1800s as copra producers for the international market, it was the chiefs (*irooj*) and the managerial *alab* that organized the labor of their workers (*dri jerbal*). Exercising their rights as landowners, they began taxing a portion of the workers' earnings (largely replacing any first-fruits offerings) and invested their gains in ships and trade stores. According to the historical political system, there was a concentration of knowledge as well as economic wealth by the *irooj*, who held specialized knowledge of the environment, construction and navigation, traditional medicines, and other important forms of knowledge including fisheries practices, and they were responsible for enforcing those conservation practices that existed. Following Pacific-wide practices, there was often a relationship of dependency between the *irooj* and his or her followers. The system adapted to the cash that came into the economy through copra payments. For instance, Kabua and Pollock reported that originally the *irooj* paid all hospital expenses for the *alab* and *dri jerbal* living on his land; eventually this policy was discontinued and a portion of the money earned was specifically set aside in a "doctor fund" (1967:62–63). Later, such social-welfare responsibilities were increasingly transferred to the government.

In a way, the Marshallese began considering the United States, as it made increasingly large cash transfers to the Marshall Islands, as metaphorically similar to the *irooj*. This relationship was specifically sought by atoll dwellers relocated from Bikini and Enewetak Atolls because of the U.S. thermo-nuclear and hydrogen bomb tests, who hoped thereby to establish direct connections with the U.S. government (Carucci 1989:85–86). Eventually they and the peoples of Rongelap and Utirik succeeded in creating that relationship; the United States has made multimillion dollar settlements, establishing trust funds for the peoples of these “atomic atolls.”

Actual food systems vary from atoll to atoll, and even within the atolls, and depend very much on population sizes. In a 1967 study of Laura (Majuro Atoll), researchers hypothesized that “native subsistence patterns will change from a traditional one to that based on a cash economy” (Dominick and Seelye 1967:1). They found the opposite: even the family with the highest income adhered to a subsistence diet, mainly because the cost of tinned foods was so high at that time that people couldn’t support themselves. To the extent that families on the outer islands have access to land and sea resources to feed their families from local foods, it is much cheaper to do so, and a reliance on local foods may reduce the amount of cash required for living. Similarly, using Marshallese technology such as local canoes can greatly decrease the costs otherwise expended for fishing (e.g., fuel for motorboats).

Of course, the picture is not so simple: substandard housing, overcrowding, pollution, and malnutrition are very real problems in Marshallese urban communities. The system is under high stress because of the density of the population and the attenuated relationships of the people, most of whom have moved to the centers from other atolls and islands and live on lands that do not belong to their own kin groups. They cannot build a proper home because of uncertain tenure. The relationships between many of the urban *alab* and the numerous peoples living on their lands are problematic, especially if the *alab* who gave permission for the family to settle has died and been replaced by another individual.

The ability of Marshallese to rely on local agricultural produce and on their sea resources is especially compromised on the highly urban atolls. People may not be able to grow their own agricultural produce, particularly if they do not have land rights, or may not have access to a boat to go to the better offshore fishing grounds. The seashells formerly found in the shallow lagoon flats are no longer available or in some cases are not eaten because they are considered polluted. If families must buy food, local foods are relatively costly in comparison to rice and tinned fish and meats. Those with large families may be reduced to eating less nutritious foods; others have insufficient knowledge of the nutritive qualities (and absence of nutrition in some) of the imported foods.

Most Marshallese still rely on their cultural system of reciprocal relationships, organized around the large extended families and the relationships among *irooj*, *alab*, and *dri jerbal*. The current concentration (although not perhaps the scale) of wealth by the local elites is to a large extent a continuation of cultural practices of concentration and redistribution followed for centuries as a productive strategy to cope with the fragile atoll environment that required close structural links and the ability to transfer goods and people from atoll to atoll. Through the elaborate exchange systems operating in most Micronesian societies, local foods can also be directly transformed into money, as when an outer-island family sends local foods to relatives on Majuro, knowing that in response the relatives will provide cash for necessary purchases or children's school fees.

Foods constantly flow back and forth between the Marshalls and its communities on Hawai'i and on the mainland of the United States; local foods and handicrafts accompany elders who participate in *kemem* celebrations such as those held to celebrate the first birthday of a child, moving against coolers of frozen meats, clothing, and other items desired from the United States (Hess, Nero, and Burton n.d.). Those interviewed, on both sides of the sending-receiving chains, reported that at times they were somewhat frustrated with the interchanges. A *lerooj* (female *irooj*) on Kwajalein complained that she was constantly being asked for cases of chickens and believed that the children should be eating more of their local foods. Those in the population centers complained of the high costs of air freight or the difficulties in planning their budgets, as one could never tell when a cooler of local food would arrive from a relative, signaling a request for money, in particular during this time of decreasing availability of cash.

At present, depending on the nature of the interaction and the place on which it occurs, one can identify at least three different economic systems in operation in the Marshall Islands that conform to at times opposite principles (see Polanyi 1957 for an overview and Firth 1965 for similar practices in Polynesia):

1. A Marshallese chiefly and extended family redistributive economy, in which wealth flows to the top, to the *irooj* and *alab*, who are then responsible for the social welfare of their workers. In this model the workers should never pay the small incidental expenses of production, which are paid by the *irooj*. They do pay a substantial proportion (often stated as 30 percent) of their earnings.
2. A governmental redistributive economy, in which public services such as health and education are heavily subsidized. Individuals pay low rates of tax; governmental costs are generally covered by external

transfers to the Marshall Islands. Marshallese often conflate chiefly and governmental redistribution since they operate in similar ways.

3. A Western user-pays economy. As external transfers to the Marshalls decline, this is the system espoused by world agencies, with individuals (workers) paying the costs of providing services. This system is considered by many Marshallese as antithetical to the proper order of social and economic relationships: why charge those who can least afford to pay these costs?

There are also transitional systems that may tap either the Marshallese economic system or wages from the government economy to provide capital to start a business, eventually moving toward a more Western distribution of costs and benefits.

These economic systems, while philosophically and practically antithetical, operate simultaneously and interact with each other on a daily basis. Previous aid projects and governmental policies, perhaps inadvertently, strengthened the second model: expensive infrastructure and outside expertise were provided, ostensibly in an effort to “kick start” development, far beyond the ability of local production to pay for such services if actual costs were truly to be considered.

There are regional variations in the relative strength and pervasiveness of the several systems as well as a great deal of contemporary contestation with regard to their operation. It appears the first two systems are strongest in Ebeye and the outer islands of the Ralik chain, consistent with the large infusions of money from the outside and the general control of such monies by the local elite, who receive the major share of rental monies as the primary landowners. In these societies much of the wealth is concentrated in the hands of the chiefly elite and governmental agencies, who then act in chiefly ways in providing the basic tools of production to the workers, including in the case of fisheries not only motorboats, but also their infrastructural support in the form of ice-making machines, cold storage, and markets.

Local Views of Sustainability

When considering projects operating in the outer islands, in particular, it is important to recognize that life on these islands has for centuries been adjusted to cycles of resource availability and periods of hardship when there might be months of rough weather making fishing difficult or when staple crops are not yet in season. Work is oriented to the task at hand, and its requirements must be integrated with other demands on workers' time. Because of the fragile nature of atoll life it has never been practical to specialize

in one economic option: the ability to draw on multiple sources provides the flexibility needed to survive when one option is at least temporarily unavailable. Thus individuals are reluctant to limit their productive labor to only one activity.

During the past century copra production has been the most successful in providing regular access to cash; it also allows workers to provide customary support to the *alab* and the *irooj*. New projects must be integrated with existing productive cycles and cannot be anticipated to operate on a full-time basis throughout the year. For a project to be truly sustainable within the existing island framework, it should ideally allow individuals to devote labor to it within existing schedules (Rodman 1987). Thus a sustainable project may need to be defined as one that allows individuals to devote labor on a part-time basis and to obtain either cash income or food for the family, but not necessarily a project that operates on a regular schedule throughout the year.

The different work schedules of men and women and of the different age groups also need to be considered. At present, outer-island communities experience extreme demographic imbalances—with a median age of twelve. There are few working-age adults, and those few are hard-pressed to provide a living and care for the dependents, even while relying on relatives in the district centers through Marshallese exchanges of local foodstuffs for goods such as rice, coffee, chicken, and meats. As primary care givers, women generally split their work time into small segments, and handicrafts are one type of export work that is relatively easy to fit into their schedules. Men can devote longer periods of time to productive work but in turn must constantly counterbalance a number of options: employment, copra making, fishing, and construction tasks in addition to community work.

Several models of sustainable income-generating fisheries projects currently operate in the Marshall Islands. One model (handicrafts using sea-shells) is labor-intensive but provides reliable earnings; the other (trochus production) requires little labor for most of the year but is capable of generating substantial income both to individual fishers and, through taxation, to local governmental bodies. Both require conservation and perhaps enhancement of existing resources to retain sustainability over time, but both projects have been successfully managed by Marshallese for the past decade. In addition, trochus can also potentially support a secondary value-added industry of producing button blanks (with little technological input required).

Sustaining the Ecological Basis: A View of Marine Resources

The current shift from national-level to local government control is a reversal of policy from that of the colonial era. Although in practice local governments were often left to fend for themselves owing to neglect by the central

government, all power was centralized at the national level from the 1930s onward, in particular with regard to the resources of the sea and the lagoons. Successive colonial governments and the independent Republic of the Marshall Islands have continued this national level of control and enforcement, although RMI legislation permits the return of management and enforcement to local governments.

There is insufficient documentation of indigenous sea tenure systems and resource management systems of the Marshall Islands before the transformations associated with colonization. Tobin (1967) provides an excellent overview of issues of sea tenure and the various rights and responsibilities associated with the marine resources of Enewetak and Ujelang. These atolls differ historically, linguistically, and socially from the islands of the Ralik and Ratak chains; however, resource control is generally similar to that more briefly described by other authors for the Marshalls in general (Mason 1946; Tobin 1952; Tobin et al. 1957; Sudo 1984). It is important to consider both issues of sea tenure, in terms of ownership or guardianship of resources, and the special rights and responsibilities of individuals and certain titled offices related to these resources. While some areas of an atoll's lagoon might be held in common, nevertheless, in the past the *irooj* and the *alab* could control access through their control of certain species, fishing techniques, or the ability to set aside reserves. However, the primary basis of the economic and political power of the *irooj* was based on land resources, not on those of the sea.

As a gross simplification, resources can be considered in broad geographic areas, with increasing control associated as one goes from the ocean to the shore:

1. The ocean itself was considered to be common property (certain external reef areas were recognized, and it was considered that foreigners should request permission to fish there).
2. The lagoon could be fished by any atoll or island resident, except as follows: nonresidents should request permission to fish.
3. The *irooj* and/or *alab* could reserve special fishing grounds, islands and islets, reef areas, and the like. Others could not fish in such areas except at the direction of the *irooj* and the *alab*.
4. Reef areas on both the ocean and lagoon sides adjacent to a *weto* (landholding typically extending from the lagoon to the ocean) were controlled by the *alab* of the *weto*. This reef area was considered to extend to the depth, roughly, of an individual's waist.

The reservation of certain fishing grounds did not necessarily relate to conservation practices, however, but often served to demonstrate and maintain political control (Carrier 1987).

In general, the waters of the lagoon and near-coastal areas were considered the property of the atoll community under the leadership of the *irooj*. In the past "first-fruits" offerings of fish were made to the *irooj*, after which time the fisher could use the resources, similar to first-fruits offerings of breadfruit and other agricultural produce. The *irooj* had the responsibility to ensure the proper management of the resources.

In addition to the geographic delineation of resources, other rights and responsibilities were recognized with regard to specific fishing techniques and species. In general, the *irooj* held specialized knowledge about sea resources and navigation. The *irooj* had specific duties in the allocation of resources: all driftwood, turtles, tuna, porpoises, and so forth, were brought to the chief, although he or she did not keep a special share but distributed these among all. In most Pacific societies turtles and specific fish might only be hunted at times the chiefs decreed. In addition, the chiefs organized the labor of fishing groups and controlled fishing techniques suitable to large groups, such as certain long nets. It was a general practice to divide the catch among community members, especially of valued species such as turtles.

Indigenous practices are based on detailed local marine knowledge (which is not equally held by all members of the community) and a mutual self-interest in maintaining the resources, maintained (and enforced) by recognized, knowledgeable local leaders. The nature of local knowledge of marine resources today substantially differs, both positively and negatively, from that of the past. Some knowledge has not been transmitted from the elders and learned by the younger generations, for whatever reasons. Conversely, today's spearfishers, who spend time in the water observing the fish through glass goggles, have knowledge about their habits unknown to previous generations. Changes in canoe and fishing gear technology have also substantially transformed current practices (see Lieber 1994:131–164). In addition, the religious and political organization of productive activities has changed.

Today, practices concerning rights to fish, whether or not certain fish are reserved for the *irooj*, and whether any offerings of fish should be made to the *irooj* vary between atolls and islands, and within atolls as well. The definition of rights depends very much on the context of use and on the positions of the individuals discussing the rights.

Following the Japanese transformations in 1934 that opened the reefs to all, it is generally recognized that anyone resident on the atoll/island has the right to use the resources. Generally it is held that no offerings of fish need be given to the *irooj*, certainly not a part of each catch, whether the fish are caught to feed the family or to sell. Some report that fish should or may be offered once a year while providing special foods for the *irooj* or at the beginning of a fishing season. Today the fishers normally decide when and

where they will fish and control their catch, choosing to divide it among family consumption, sharing, and sale depending on the size of the catch and other special circumstances.

In practice, the indigenous system of resource management has been severely compromised both by colonial practices and the discontinuation of indigenous sea tenure in 1934 and by contemporary population shifts whereby most Marshallese, including *irooj* and elected leaders such as mayors, may today reside outside their home areas for long periods of time. Resource management, which in the past was mainly directed to near-shore resources, has been seriously affected. In some cases indigenous practices persevere: certain island and reef areas the *irooj* previously set aside as reserves are still recognized; all the young fishers of an atoll may be taught not to take certain fishes at certain locations in order to protect other species. In general, however, local conservation practices operate on a piecemeal basis, and the contemporary system of top-down control has been impossible to manage or enforce, especially on the highly urban atolls primarily comprising immigrants or when the *irooj* and *alab* reside elsewhere. Even when an *alab* is resident today, she may take pity on fishers who break accepted conservation practices, knowing they are fishing to feed their families.

Active management of resources is especially attenuated on highly populated Majuro and Ebeye, where so many of the residents are not originally from these atolls, and the habitat itself has been substantially transformed by dredging, waste disposal, the presence of a foreign fishing fleet, and other activities of urban life. The condition of the fish stock is compromised. There are still some fish traps at both extremes of Majuro. Some are no longer used. There is contention over the use of others. Some were freely used for some time, following an unstated ethic that fish collected from the traps should be shared. Similar to experiences in other Pacific countries, where extended use rights are permitted for feeding one's family but not for commercialization, once fishers began selling fish harvested from the traps, the owners tried to reassert their control of the traps. But as long as resources are used to feed the family, the *alab* will generally not stop anyone from fishing, even if the fishing counters conservation practices.

The following contemporary practices by Marshallese, outsiders, or both that adversely affect the fish stock and larger ecological system were identified in interviews I conducted in 1996 and 1997. It appears that many Marshallese know such practices are destructive, but they happen in the enforcement gap between traditional management practices, new technology and political structures, and the failure of national-level control. The list could be considerably expanded.

1. Pollution of the reef through solid wastes and sewage
2. Unregulated use of long nets
3. Keeping undersize fish and shellfish
4. Destroying the habitat, for example, by turning over rocks to collect shellfish, then not turning the rock back
5. The use of bleach and poisons to stun or kill fish, affecting the larger habitat
6. The use of scuba gear for fishing, extending the range and scale of fishing far beyond indigenous techniques, resulting in overfishing

The list highlights issues of contemporary technology and practices that were never covered, except by general principle, under indigenous management practices.

It appears that the most feasible way to reestablish management and conservation of resources for future generations would be to return to (and support) control by leaders of the local communities, while basing such controls on (updated) indigenous practices (Spennemann and Alessio 1991). This recommendation is not based on a simplistic faith that indigenous peoples are natural resources managers. As Lieber summarizes for Kapingamarangi fishers, recognized by Micronesians as master fishers:

Kapinga fishermen are maximizers, not optimizers of fish catches. They will, according to what they say and what they do, take every available fish on an expedition whether or not they will eat them and regardless of whether they have the canoe space to transport them back to the islet. Fish can always be given away, and someone can always be dispatched to the islet to summon other canoes to transport the fish. The idea is to get them all. So, if traditional fishing activity appeared to achieve an ecological homeostasis of human and fish populations, it wasn't because Kapinga fishermen were conscious or unconscious conservationists.

The assumption that Kapinga fishermen did not have the technology that could threaten the breeding stock of local fish populations is also false. Three sorts of constraints prevented traditional fishing activity from exterminating these fish. None of these constraints are applicable at present. (Lieber 1994:132-133)

Existing technology and fishing techniques, resources, the ways fishing is organized, constraints, and incentives to fishing must be clearly analyzed. However, it is both cost-effective and feasible to return control of resources to those who stand to gain or lose the most by their use. This process must

occur in full recognition of the substantial social and ecological transformations that have taken place. Local leaders have not had this responsibility for several generations, practices and technology have radically changed, habitats have been severely compromised by the bombings of World War II, and the demography of local populations has changed, as have the governing political structures. While a return to local control is called for, no simple return to once-existing practices is possible. Traditional and contemporary regulations must be combined and supported to ensure there is no gap similar to that experienced in some communities now, when it appears that neither traditional nor contemporary regulations are recognized and maximum gleaning and destruction occur.

Contemporary local leaders must personally endorse and enforce the regulations. Pacific Islanders respond better to external social control by recognized leaders than to an internalized set of practices. To be effective, a leader of sufficient standing should be present in the community. Since there is such dissension over current practices, rights, and responsibilities, community discussions and agreement on the practices to be followed would be an essential first step. Those interviewed recognized both the difficulties and necessities of reestablishing such controls, suggesting that a series of discussions be held with the mayors, council members, *alab*, and those living on the land and using the sea resources.

In order for local resource control to succeed in areas in which foreign fishing fleets operate, a concurrent program to control outsider actions and mitigate problems of waste disposal must also be in place. At present it is simpler to blame all the problems of pollution and improper fishing practices on outsiders than to seek a solution.

The reestablishment of atoll or island management and control of sea resources will require a multilevel approach; Majuro and Ebeye will both require extensive community meetings, while the other atolls or islands may perhaps be grouped according to similar needs. After a joint workshop, the outer-island mayors and local experts may, in local community meetings, develop their own plans; the enabling legislation at both national and local levels is already in place.

Restructuring the Marshallese Economy

Separate Asian Development Bank–fielded teams were involved in overall policy restructuring and in the agricultural, fisheries, and tourism sectors; all terms of reference call for a “sustainable” future. An RMI national economic summit, originally planned for December 1996, was delayed, and the units worked relatively independently in the absence of national policy directives.

Thus, the agricultural team worked to decrease imports of rice and increase local production, just as the fisheries team worked to enhance “subsistence” or coastal fisheries for local use. However, creating a sustainable economy will require a joint effort and recognition of (1) ties interlinking local, metropolitan, and global economies and (2) intersectoral choices and prioritization of goals rather than independent movement on all fronts (i.e., it may not be possible to decrease rice imports, but restructured local fisheries may permit decreased reliance on imported poultry and meats).

Contemporary Marshallese Food Systems

Marshallese categorize edibles as *manga* (starch food) and *jelele* (relish) (Pollock 1992:26). While a proper meal combines these two categories, the bulk of all food eaten is starch foods, today primarily rice and breadfruit (ibid.). Grated coconut or coconut cream can provide the relish necessary to complete a dish if necessary, but a preferred relish is fish or meat. The role of nonstarchy vegetables and fruits is minor. Serving a wide variety of foods within each of these categories helps distinguish festive from daily meals, giving rise to the feeling that one has been especially well fed.

In 1994 and 1995 foods accounted for 28.21 percent and 24.06 percent of all imports. Cereals, including rice, made up only 10 percent of food imports, in comparison to meat, fish, and shellfish products, which made up 33 percent (OPS 1996). Rice, imported meats, fish, and meat/fish products will always remain a part of the Marshallese diet because of both the convenience of their storage and preparation, and the variety they provide. In 1997 agricultural initiatives advocated reliance on growing local foods because of their increased nutritional qualities and low cost; however, in the urban areas, population densities and wage labor both constrain agricultural production.

At present the agriculturalists are attempting to bolster breadfruit production. Rather than trying to understand indigenous food systems, the UNICEF Family Food and Nutrition Program initially began by trying to educate Pacific peoples to the importance of eating the “three basic food groups” considered necessary for a balanced meal according to Western tripartite thought. Only recently have they realized the importance of building upon indigenous constructs—in the Marshallese case, upon a binary system based on starch and relish foods. Nor does a simple logic of local versus imported apply, nor are imported foods simply a factor of recent Compact of Free Association payments. Based on work in the early 1960s before the major buildup of U.S. transfers, Tobin reported:

The Ujilang people are used to, and require clothing, rice, flour, sugar, kerosene, matches, fish hooks and lines, fish net material, sail cloth, and other necessities. They are naturally frustrated and dissatisfied when they cannot obtain them. The islanders cannot understand why these necessities have not been made available to them regularly. As the leaders and others of this group have told the writer: "We do not ask the American Government to *give* us anything, we just want to have the opportunity to purchase the things we need in order to live." (Tobin 1967:204)

Attempts to replace rice with local foods may be anticipated to meet with considerable resistance. Although rice is an import, it is by now fully integrated within Micronesian "starch" foods. Recent cognitive studies of contemporary Micronesian food systems indicate that rice is now considered among the core starch foods, much as Europeans consider many New World foods as absolutely essential to the diet. The simple dichotomization between local and imported foods that underpins Western economic understandings of food "dependence" and locates such dependence in recent economic relationships between the United States and its former territories deserves reconsideration. Sustainability, if it is to be useful as an analytical concept, must be defined within the culturally appropriate terms of what indigenous people consider it critical to sustain. I suggest that access to rice would be one such commodity.

The further development of coastal fisheries for local consumption could, in contrast, make a much more significant contribution to reducing food imports and to increasing the nutritional quality of the Marshallese diet. Imports of meat, fish, and meat or fish preparations, comprising 33 percent of the value of all food imports, are high-cost imports compared to rice, a low-cost import that contributes a substantially larger proportion of the diet.

The development of coastal fisheries is a prime objective of the Marshall Islands national government (OPS 1991:201) and of the communities (National Fisheries Development Plan Mayor's Workshop 1996). A great deal of planning and work remain to enable the increased contribution of fisheries to the Marshallese economy. Much of the Marshall Islands Marine Resources Authority emphasis in the past was on pilot projects such as the Japanese Overseas Fisheries Cooperation Foundation projects operating on Arno; support for these income-generating projects to provide fish to urban markets will continue in importance. Initiatives to support non-market-oriented fishing may, however, also be required.

In addition to helping correct import-export imbalances, a renewed em-

phasis on fish over poultry and meats could also make a significant contribution to Marshallese nutritional imbalances. While more extreme in the urban communities on Majuro and Ebeye, poor nutrition also exists on the outer islands (Ministry of Health 1991), and can partially be traced to a poor understanding of the effects of substituting certain imported foods for local foods. Imported chicken and turkey tails, for example, contribute substantially to the increased fat in contemporary Marshallese diets that contributes in turn to diseases such as diabetes, obesity, and heart problems. The current health status of Marshallese is poor. Health specialists report that in the past people ate fish more frequently and that there is not enough fish in the diet now. In the past more sharing of fish occurred in the communities; now excess fish may be sold or sent to Majuro or Ebeye. Women and children are particularly at risk. "Malnutrition is due to the lack of understanding of proper nutrition, increasing inadequacy of local food supply, high dependence on imported processed food, [and] poor maternal health" (Lateef 1991:17–18, based on the National Nutrition Survey). Although some young children demonstrate a preference for chicken and meat, fish is still a highly preferred item of the diet, and most Marshallese interviewed would prefer to eat more fish than they currently do. Fresh fish is highly nutritious with a substantially lower fat content than poultry and meats.

Although it is difficult to draw strong conclusions, since the production figures are based on estimates, Table 2 shows a production increase for both agricultural and fisheries products in the period from 1994 to 1995. During the same period, food imports declined both in real value and even more as a percentage of total imports. The import value of meat and meat/fish preparations countered this trend, both substantially increasing, whereas the importation of cereals including rice mirrored and even declined a bit more than the overall decline. The most striking difference between imports in 1994 and 1995, according to the data in Table 2, is the decline in imports of fish and shellfish from nearly US\$1.5 million in 1994 to a little over \$0.5 million in 1995—a decline of nearly two-thirds. Assuming accurate and comparable data for the two years, this decline could indicate the preliminary success of projects to provide more local fish for marketing within the Marshall Islands. If that is the case, one could hope for a continuation of this trend and for substitution of local fish for meat and poultry imports in the future (perhaps aided by governmental regulations).

Besides having the potential for better nutrition and a higher dollar impact on food imports, increased fishing production may be easier to support than agriculture. Breadfruit trees were destroyed and severely damaged during the storms of the late 1980s and early 1990s, and it takes years to re-establish breadfruit production. However, fishing remains a primary activity

TABLE 2. 1994–1995 Imports and Subsistence Production

	Value (U.S. dollars)		Change, 1994– 1995 (percentage)
	1994	1995	
Subsistence production ^a			
Agricultural products	1,101,042	1,215,763	+10
Meat products	1,536,410	1,713,471	+12
Fish and shellfish	2,915,992	3,238,828	+11
Fish	2,852,174	3,168,096	+11
Shellfish and crabs	63,818	70,732	+11
Imports ^b			
Total imports	70,398,603	75,054,694	+7
Food imports	19,861,000	18,056,000	–9
Cereals (including rice)	2,127,349	1,890,313	–11
Meat, fish, and preparations	6,635,920	6,081,418	–8
Meat	3,334,191	3,503,849	+5
Fish and shellfish	1,472,017	543,340	–63
Meat and fish preparations	1,829,712	2,034,229	+11
Food as percentage of total imports ^c	28.21%	24.06%	–15

^aSource: *Marshall Islands Statistical Abstract, 1995*, table 7.1 (OPS 1996).

^bSource: *Ibid.*, table 8.4.

^cSource: *Ibid.*, table 8.5.

within both urban and rural households. Fishing is a highly favored pastime, and men engaged in wage labor routinely fish as well—in fact, they may have increased access to prime fishing spots in that they can afford to purchase outboard motorboats. The necessary technical skills and fishing equipment are widely distributed in the communities: on a national level 57 percent of all households own a fishing pole, and another 52 percent own spearfishing equipment, with only slightly higher rural to urban ratios of ownership; 22.7 percent of households own a long net and 19.5 percent a throw net; 18.6 percent of households own a motorboat, and 12.2 percent own other boats; in rural areas boat ownership increases, with 25.3 percent of the households owning a motorboat and 19.3 percent owning other boats (OPS 1995: table 91). On most of the outer islands the lagoon resources are not too heavily affected by pollution or overfishing, although fishers do report the decline of certain species. Even in the urban center of Majuro and to a much lesser extent Ebeye, which have suffered the loss of fish and shellfish species due to pollution and overfishing, households still rely on local fishing and on purchasing local fish in the stores.

Assessing Sustainability

How shall economic viability and sustainability be understood in ways acceptable both to foreign donors and to members of the Marshallese community? In the simplest terms on a local Marshallese level, I suggest that a project is sustainable if the social, political, and economic terms under which it is operating permit it to continue. Sustainability thus requires the ability of managers and workers to maintain the required labor and the resource base. Sustainability also requires special attention to demographic realities, gendered work activities, and resource management. Politically a project must be acceptable to community members and its leaders. Economically it must be able to continue to balance monies expended and received within the larger social matrix within which it is operating.

At the national level a prioritization within achievable objectives would be helpful. While the Marshalls may never again be able to produce all the foods its people eat, it may be able to reduce certain targeted food imports significantly.

At the international level, it is critical to stop labeling all monetary transfers from "metropolitan" to "peripheral" communities as aid. Certain transfers, such as those for the Kwajalein missile base, pay for land and lagoon alienation, just as compact-related transfers pay for the historical, strategic denial of such resources to third parties. Other transfers sweeten payments for resource exploitation beyond the price levels the distant water fishing nations are willing to concede (Nero 1997). These "aid" payments themselves contribute to continued structural imbalances within the local economy.

One of the key differences in the different economic systems currently operating in the Marshall Islands (and arguably in Western economies as well) is the degree to which projects are considered to stand alone or allowed to be embedded within wider sociopolitical structures. As long as analysts continue to view economies as separable, rather than interlinked and interdependent, our analyses, like the economies, will remain structurally imbalanced.

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ARTISANAL CORAL REEF FISHERIES AND SUSTAINABLE DEVELOPMENT: THE ARNO ATOLL FISHERIES ASSOCIATION

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The concept of sustainable development is inexact, requiring additional specification in application. How the subject of analysis is bounded will have consequences for understanding what is being sustained as well as for determining whether something is sustained. Here I examine a fisheries development project in the Marshall Islands. Shifting boundaries, I create three accounts of the project. In the first account, which focuses on resources and monetary cost and benefits, the project is clearly unsustainable. In the second account, focusing on international relations, the project sustains the relations of power and dependency. In the third account, I suggest that evaluation should take into account history, process, and the costs of knowledge rather than settle for facile assessments of success or failure.

IN THE FALL OF 1989, a development project began buying fish in rural Arno Atoll of the Marshall Islands for resale in nearby Majuro Atoll, the urbanized capital of the country. Japanese foreign-aid agencies managed the project and bankrolled it with more than US\$6 million. When I arrived to begin fieldwork in the fall of 1993, it had paid out over US\$270,000 to Arno fishermen and was shipping around a ton of fish each week. While not without problems, it seemed a viable concern. The report of the Japanese management team as they turned the project over to local control showed the project operating at a sustainable level, and an expatriate advisor congratulated the staff of the fisheries agency on their success. A few short years later, however, many judged the project a failure, another in a series of troubled fisheries projects in the island Pacific.

What went wrong? It is possible to write different accounts, each arguably true, depending on how one contextualizes the analysis. In this article I construct three accounts to examine ways in which different levels of analysis point to different challenges for sustainable development and different understandings of what it might mean. I begin with a short project history and economic analysis, then recontextualize it as a discussion of the political economy of fisheries projects in the Marshall Islands, and again as a historical event in the dynamic unfolding of postcolonial processes among islands formerly incorporated in the United States Trust Territory of the Pacific Islands.

Economic Development in the Marshall Islands

The Republic of the Marshall Islands (RMI) includes thirty-two low-lying coral atolls and islands located in the mid-Pacific. Traditionally, inhabitants subsisted on fishing and cultivation of a small number of crops, primarily taro, coconut, breadfruit, pandanus, and arrowroot. Most lands were held in usufruct by matrilineages, *bwij*, segments of exogamous matriclans, under the control and protection of chiefs, *iroij*, who could alienate or assign land parcels, *weto*, and who received tribute through personal service and first-fruits offerings. *Alabs*, usually males but sometimes acting on behalf of a senior female, managed the lands and the *bwij*, and consulted with the *iroij*. Succession was based on seniority within and between generations as well as on ability. Extended families resided in households, often but not necessarily organized by uxorilocal residence, which served as units of consumption and land-based production, while gift exchange distributed food and other goods and built ties among households linked variously by kinship, friendship, and proximity. Living in fragile environments vulnerable to typhoon and drought, islanders emphasized developing diversified residential and economic options through social relationships (Alkire 1965).

Explorers, whalers, and traders made landfalls in the Marshalls beginning in the sixteenth century, but extended contact only followed the arrival of missionaries in 1857. Germany asserted sovereignty over the Marshalls in 1885, with the support of one of a number of rival high chiefs, *iroij laplap* (Hezel 1983). Japan took the Marshalls and the rest of northern Micronesia from Germany at the opening of World War II and held these territories until U.S. invasions won control in 1944. Commercial interests in the Marshalls centered on copra, the dried meat of the coconut, and the oil that could be obtained from it. With the encouragement of the chiefs, who managed the collection of the copra in return for a large share of the payments, the Marshalls became the largest producers of copra in Micronesia. Earn-

ings from copra production as well as wage labor in phosphate mining were used to purchase staples such as rice, flour, sugar, salt, tea, tinned meats, tobacco, soap, and cloth. Machetes, sewing machines, and throwing nets entered local tool kits. Cultivation of taro and breadfruit declined.

When the United States sought United Nations ratification of its *de facto* control in Micronesia, one provision was that the peoples be prepared for self-rule as an independent nation. Although efforts in the first decades of U.S. administration were somewhat perfunctory, eventually the United States began making more serious efforts to examine the options for economic development. In 1965 R. Nathan and Associates was commissioned to produce a report that emphasized three industries: agriculture, tourism, and fisheries (RNA 1967). While there have been changes in thought about what form development of these industries should take, in the Marshalls these three sectors continue as the focus of government planning.¹

In the Republic of the Marshall Islands, little land and poor soil limit the potential for developing agriculture for export. With a population that has multiplied sixfold since the end of World War II, it is doubtful that the Marshalls can produce even enough calories for its own population without significant technological development in agriculture.² Low prices and irregular shipping discourage expansion of copra production. Tourist development has been inhibited by the complexity of land tenure as well as by underdeveloped infrastructure and limited capital. The most visible development efforts have been in the fisheries industry.

In the Marshalls there are several kinds of fisheries, and these are variously linked to each other by drawing on the same pool of household resources, exploiting the same stocks, selling to a common market, or making demands on national and international development aid. There are also links to other sectors of the economy, including agriculture, retail, and the public-service sector. While such links exist in any economy, in the Pacific Islands these sectors are connected not merely through national accounts and markets, but at the household level. Islanders purposefully create and maintain these connections, relying on diversified economic activities for security and access to various goods and services, which circulate through several modes of exchange and redistribution. Nero (1997b) describes three economic systems operating concurrently in the Marshall Islands that are based on different models of social relationships: a redistributive family and chiefly system, a redistributive governmental system, and a Western user-pays system. A basket of food originating in family production may be exchanged for cash from a relative's wage earnings to pay for clothes bought at a store, for example. (The U.S. dollar is the official currency of the RMI.)

The RMI fishing industry is usually divided into three sectors: industrial

deep-sea fisheries for pelagic species; and artisanal near-shore fisheries, divided between subsistence and commercial sectors (Kattil 1987). In addition, local businessmen seek to develop a charter sport-fishing industry; several export small ornamental fish for the aquarium market. Recently a consultancy of the Asian Development Bank suggested that collection of shellfish for handicrafts should also be recognized as a significant fishery sector (Nero 1997b), addressing biases in how fisheries are usually conceptualized around male activities, contributing to gender biases in development planning. Male fishing in the Marshalls focuses predominately on the capture of finfish, while women pursue shellfish and crustaceans.

The distinction between artisanal and industrial fisheries captures differences in organization. Artisanal fisheries are labor- rather than capital-intensive, use relatively simple gear, may use unmotorized boats or small motorized craft, and land fish in small quantities. Industrial fisheries are capital-intensive, depend on wage labor, use more complex gear, and depend on large catches. While artisanal fisheries vary in the range of species exploited and the techniques employed for capturing them, industrial fisheries concentrate on one species and one gear type.

Industrial fisheries in the Marshall Islands concentrate on international exports and have been the biggest focus of development efforts, including construction of a fleet-basing facility in Majuro and a loan obtained through the Asian Development Bank to operate a fisheries school and build a small local deep-water fleet. Currently, however, fleets of distant water fishing nations such as the United States, Japan, and China are the principal participants in this sector, and only a few dozen Marshallese find employment on boats, at the base, or in the government fisheries agency.

The government also seeks to develop the small artisanal commercial fin-fisheries sector for internal food supplies. Population growth has been accompanied by the increasing concentration of the people in the urban centers of Majuro and Kwajalein Atolls, seeking education, jobs, health care, and entertainment (Alexander 1978). Two-thirds of the population now resides in these urban areas, living primarily on imported foods. Through artisanal commercial fisheries development the government seeks to (1) supply food fish from the rural atolls to urban populations, (2) improve rural people's access to cash and decrease their desire to move to the urban centers for jobs, and (3) substitute locally produced food for imports and decrease the balance-of-payments deficit (OPS 1991).

Artisanal fisheries long constituted the major source of animal protein in the diet of Marshall Islanders. A wide variety of named fishing techniques enabled islanders to exploit complex combinations of habitat, species, weather, season, and social purpose. For most men being a fisher was one of the most

socially significant roles in life, and other fishers would readily evaluate a man's skill and knowledge. It has been a dynamic industry, with fishers seemingly eager to take up new gear and techniques, such as the throw nets or goggles introduced by the Japanese.

Commercialization of the artisanal fisheries is not new, but it is uncertain how long and to what degree fish have been diverted from food and exchange networks among islanders into markets. It is likely that fish were bartered with traders from the nineteenth century on, and some Arno residents report peddling fish during Japanese times. Spoehr (1949) notes Majuro fishermen selling part of their catch. One leader in Arno used cash income from his government job to purchase outboards and boats, which his family used to bring fish from Arno to Majuro for sale in the 1970s. A fishing cooperative operated in Majuro from 1977 to 1983, failing because of problems with maintenance and management, but having sold several hundred tons of fish on the market in the meantime.

A significant factor in commercialization is the cultural construction of rights in fish, which in general belong to the fisher who has captured them. As one fisher asked me, "Who can own fish?" suggesting that ownership was connected to control and that fish in the seas are not under anyone's control. Marine tenure assigned rights in only a few species, most notably turtle, to the *iroij*. *Iroij* also controlled access to several group techniques for fishing and certain areas of the reef or lagoon (Tobin 1958). Fishing territories otherwise were limited to the area of beach and reef immediately adjacent to a *weto* as far out as a man could stand and fish.³ Having been granted access to such a territory by the *alab*, the fisher was obligated to offer the *alab* some of the catch. The fisher is expected to support adequately the food needs of household and relatives and should show kindness and generosity to friends and neighbors. The distribution of a catch is a fisher's right and responsibility, and while some people in Arno mourn the increased diversion of fish from networks to markets, no one suggested to me that it is forbidden by custom, *manit*.

Arno was well situated for the purposes of the government's artisanal commercial fisheries project. Majuro has the largest population (around twenty thousand or 46 percent of the total enumerated in the 1988 census) and best-developed commercial sector of any of the Marshalls. Arno is only about fifteen miles from Majuro, has a good-sized lagoon and a substantial population, and 98 percent of all households reported that they engaged in fishing (OPS 1989).

Arno leaders began talking in the 1970s about ways to improve their opportunities to sell fish. In 1979 the Marshalls adopted a constitution and formed a government that acted under the supervision and control of the

U.S. Trust Territory of the Pacific administration. Within the government the Ministry of Resources and Development was given charge of development efforts, and President Amata Kabua appointed Senator Brenson Wase from Arno as minister. The Marshall Islands Marine Resources Authority (MIMRA) was given charge of fisheries management and development.⁴ Although discussions with the Japanese International Cooperation Association actually started before implementation of the Compact of Free Association in 1986, little was done for artisanal fisheries during the U.S. Trust Territory period. With the implementation of the compact, however, discussions gained a new impetus. Agreements were concluded that the Japanese International Cooperation Association would construct fishbase facilities and improved transportation infrastructure. In 1988 the Overseas Fisheries Cooperation Foundation (OFCF), another agency of the Japanese government, entered the picture and provided an operating plan and funds. MIMRA's chief of fisheries explained to me that, as the Marshallese agency was new and inexperienced, its staff followed the proposals of the Japanese.

The plan for the Arno Atoll Fisheries Association addressed the perceived constraints to the development of the commercial artisanal finfisheries sector (OFCF 1987).⁵ These constraints could be categorized as technical and economic, but the plan also addressed their social dimensions. Key features of the plan included

1. Capital investment. The Japanese International Cooperation Association provided \$4 million for infrastructure and capital investments in Arno and \$2 million for Majuro. OFCF provided \$500,000 for equipment and operating expenses.
2. Markets. The project would develop markets for fish purchases in Arno and sales in Majuro.
3. Training and management. The project would train employees through both formal programs in Japan and on-the-job training; OFCF would provide project managers.
4. Access to motorboats and fishing gear. The project would provide eight outboard motorboats and access for all fishermen in Arno by giving fishing crews turns in a monthly rotation. As project success would depend on achieving a certain level of production and past experience shows that artisanal fishers in the Pacific are unlikely to switch to full-time fishing (Rodman 1989), rotating access to boats would maximize catches, limit capital investment, and promote equal access to project benefits.
5. Fish processing and storage. The project would provide ice and coolers to fishers and provide cold storage for holding fish in Arno and Majuro.

6. Transport. The plan provided a boat dedicated to the transport of fish and supplies between the two atolls. A truck with a crane for lifting hundred-pound coolers of fish also provided on-atoll transport between the two fishing bases on the islets of Ine and Arno within Arno Atoll.
7. Transport Infrastructure. The project would construct a causeway to link the major islets on the western side of Arno Atoll and improve the channel by which small boats enter Majuro lagoon.

The minister and the other Arno senator, who was also a member of the lineage of *iroij laplap* in Arno, traveled to the major islets and held meetings to discuss the plans and tell the fishermen to form crews for using the boats. Construction was begun on facilities on the islets of Arno and Ine within Arno Atoll. Each fishbase was equipped with cold storage for fish, a diesel generator, scales, a water catchment, an office and shower, piers on lagoon and ocean sides of the islet, large coolers for transporting fish, a stock of fishing gear for sales and rental, and fifty-five-gallon drums for fuel storage. The Arno islet base also had ice-making equipment and spare parts that supplied both bases. Closer to Majuro, it was the Arno Atoll headquarters of the Arno Atoll Fisheries Association and the port of choice for shipments between Arno and Majuro. OFCF supplied a thirty-five-foot boat, the *Jolok*, for making these trips. The Japanese fisheries experts from OFCF moved into a prefabricated house erected near the fishbase and Marshallese were hired to assist them in buying fish, operating the *Jolok*, maintaining equipment, and marketing the fish.

The project began buying fish in August 1989. When its turn came, a fishing crew was given use of an outboard motorboat, ten gallons of gas, ice, and a cooler. Crews made their own decisions about where to fish, which techniques to use, and what kinds of fish to pursue. They were instructed to gut the fish as soon as possible and store them on ice in the cooler for transport back to one of the bases. There the fish were inspected, sorted by price categories, weighed, loaded into large coolers, and stored in the walk-in coolers. Fishing crews were paid in cash with a 10 percent deduction for use of the boat. Three times a week the fish from both bases were loaded onto the *Jolok* and taken to Majuro. Some were sold directly from the dockside, but most were loaded onto a truck for wholesale distribution to schools, the hospital, the two large grocery stores, and the ubiquitous roadside family-operated retail stores.

Some problems occurred during this stage, normal challenges for any start-up enterprise. *Alabs* for the *weto* used for the bases thought it proper that they have a say about who was hired to work at the base—some nomi-

nations worked out, others didn't. Some fishermen were careless about the project boats, so there were collisions, propellers damaged running over the reefs, and rumors of petty sabotage, like pulling spark plugs from the outboards. The project managers decided to appoint two boat operators from each major islet to be responsible for the boats. There was some initial resistance to cutting the operator in for a share of the catch, which was overcome when one of the staff asked the fishermen if they would mind the boat drifting away while they were out with spears or nets, and if the operator's contribution wasn't important in trolling.

This phase of the project was scheduled to last two years. Reports say about seventy-five men regularly went out on the boats, and perhaps two hundred participated at some level. Fishing was good, yielding 137,000 pounds of fish and earning fishermen \$104,000. While not all trips were successful, with charges levied as a proportion of sales the financial risks were low. With luck, a fisher might walk away with \$50 or more as his share from a few hours out fishing—the equivalent of selling four bags of copra, usually a couple of weeks' work. Also, with the OFCF project managers came access to OFCF funds. It is no surprise, then, that MIMRA asked for an extension of the project. OFCF complied and supplied an additional \$200,000 capital, some of which was used to purchase additional equipment and parts, the rest to fund operating costs.

The renewal was not simply a continuation on the old basis, however. A good portion of the original fund had gone to subsidize fishing. The whole \$500,000 had been spent, while the project realized \$200,000 from sales. It would be hard to characterize this first phase as a sustainable development project. It was decided to start charging fishermen directly for operating costs such as gas and ice, gradually raising prices in steps to a near-market level.

This was a clear change from the original practices of the project, and Arno leaders and project personnel again traveled around Arno, holding meetings to explain the changes. The Japanese told the fishermen that the charges were necessary for continuing supply purchases, that without the charges the project would only be buying fish for a couple more years. According to the current fishbase manager, the fishermen reluctantly accepted the changes.

When I came two years later, many were still very unhappy about this shift. I asked fishermen whether they understood why charges were added; few said they did. I asked about the meetings held to explain the changes. Some said they had never heard of the meetings; others said they hadn't gone. A manager contradicted some of these men; yes, they were at the meeting, he claimed. Clearly, this change in operations affected attitudes toward the project. It seems likely that many interpreted this change as a

shift from one of the economic systems described by Nero to another, a use of governmental power to redefine social relations against their wishes. What had been a government project to help the people, redistributing resources in return for labor contributions to a community project, may now have appeared as a profit-seeking business enterprise. One can apply Scott's concept of a moral economy not only to the family and chiefly redistributive system; other systems, including Western markets, are equally founded on premises about the proper relations of people with respect to goods and services. If, as Lieber (1994) says, such premises underlie authority relations that sustain institutions, this shift redefining the moral premises would mean that, despite outward continuities, to Arno people the project was now a fundamentally different organization. Following less the hierarchical organization of the redistributive systems, it became more susceptible to the individuated decisions of fishers to bypass it for other markets noted below.

This second stage lasted two years. In 1993 the project was turned over to MIMRA. Boats were privatized. A boat with its outboard motor sold for \$5,000, with \$2,000 required as a down payment and the balance to be paid out of sales to the project. People were invited to apply for a boat, and contracts were signed with those who were first to come up with the down payment. The Japanese managers drew up a draft report on the project's history and a plan for continuing operations. They projected ten years into the future, showing a sustainable project. They left in the spring of 1993. When I arrived in the late summer, the Marshallese personnel of MIMRA and project participants were managing on their own, buying and selling fish, maintaining the equipment, and keeping the books. The *Jolok* was making about three trips a week, carrying coolers of fish to Majuro and drums of fuel to Arno.

Some Arno residents thought the project useful; it provided an alternative to copra for income, expanding their options and supplementing their ability to buy staple foods and household goods. It helped them cope with declining copra productivity due to tree senescence, infestation, and damage from a 1989 typhoon. Ice became available for cooling drinks. Other residents welcomed the regular connection to Majuro provided by the *Jolok*. After MIMRA decided to allow passengers on the boat (which the Japanese had forbidden), it became an ocean taxi, carrying people, local produce, and retail goods back and forth, intensifying family exchange processes. One man, employed in Majuro but married to a woman with land on Arno, became a weekend commuter.

Other people were less satisfied. They said the project didn't really help people in Arno. The prices paid for fish were too low and not all kinds of fish were purchased. People were aware of the prices the fish sold for, both

wholesale and retail, in Majuro, and some portrayed the differences as taking advantage of Arno people. Fish were becoming harder to come by; it took more work to catch enough to feed a family or to pay for gas and ice. Some fish were smaller, and the annual migration of grouper through the major channel into the lagoon, once guaranteed to provide a bounty, had become small and uncertain. Some said there were fewer fish: how could there not be after eight boats had been out fishing day and night for four years? Others said the fish were still there, but fishermen with poor technique had hooked them and then lost them, and now the fish were easily scared and ran away. Others said the problem was that fishermen from Majuro came over to steal Arno fish.

At the project level, managers were worried that not enough fish were coming in. Some fishermen developed their own analysis of marketing economics and decided to take their fish by themselves to Majuro, where they could capture the higher wholesale prices and sell fish the project wasn't buying. They could also take advantage of the wider consumption opportunities of the capital, including the liquor sales banned in Arno. The project thus lost cash flow and margin. The problem was exacerbated by the decision to require down payments on the sale of project boats; it wasn't people dependent solely on fishing who could assemble that kind of payment quickly, but store operators and people with wage jobs. The interests of such boat owners were less tied to the project; they might combine fish marketing with restocking their stores, and they had alternatives for getting cash. Some charged that the people marketing the fish in Majuro would take the best fish first to stores run by relatives rather than to the larger stores that would take all kinds of fish, that they let the stores weigh the fish, or that they left the coolers on trucks parked in the sun where the fish would spoil; all contributed to reduced income. On the Arno side, managers worried about the delays in getting spare parts and the amount of fuel charged to the project that was used up in Majuro. On the Majuro side, the chief fisheries officer and the MIMRA director worried about whether receipts would meet expenses and considered whether to turn the project into a cooperative, balancing their hope to better capture the fishermen against fears of problems based on the history of the defunct Majuro cooperative.

Given the uncertainties and various evaluations of the benefits and prospects of the Arno project, how is one to produce an analysis of whether the project was sustainable? One party, the Japanese, seemed to have a firm position, expressed in their draft report and prospective plan (OFCF 1993).⁶

Before offering my own analysis, I wish to pay my respects to the OFCF managers of the Arno project. Consultants such as Elsey (n.d.) or the team sent for the U.S. National Marine Fisheries Service (Milone et al. 1985) visited the Marshall Islands in the mid-1980s and raised doubts about the

advisability of attempting to develop commercial fisheries in the outer islands. Their reports noted significant obstacles—high fuel costs, lack of infrastructure, the unknown commitment of outer-island fishermen, the uncertain but limited size of fish stocks, the lack of fisheries and management expertise, the competition of cheap imports of canned fish in the urban markets. The National Marine Fisheries Service report concluded, “We consider the risk factors here to be high.” Yet the government, counter to the often visible “urban bias” of developing countries, persisted in seeking outer-island development projects, and the Japanese took on the challenge. In accord with the rhetoric of international development, they delivered a project that emphasized self-reliance, of both the fishers and the nation linked as producers and consumers, and could be represented as self-generating after an initial infusion of expert (foreign) management, technology, and capital.

That said, I will argue that what it means to be sustainable depends on how a given set of practices is contextualized. By recontextualizing the Arno project, I hope to raise questions about representations of sustainability and development. Ferguson (1990) describes how Lesotho was rhetorically reconstructed as a suitable object of international development efforts. The conceptual boundaries used to define the development project, aid payments, the locus of the nation, and the results of projects profoundly affect an analysis. A report is a rhetorical device rather than an objective lens on the project; in the case of the Arno project, it is a mechanism through which the experts construct a representation of a project that can pay its own way while generating incomes for producers in Arno and food for consumers in Majuro. The representation defines the project, in part, by the boundaries it draws separating project and context.

Representations and Economics

The OFCF report includes three sections: a description of results, prescriptions for future operations, and predictions of the results of this plan, including tables of financial projections. It begins by summarizing the operations between August 1989 and December 1992 in terms of fish and dollars:

In actual operation for three years and five months between Aug. 1989 and Dec. 1992, the total catch weight is 279,103.6 *lb.* (approximately 127 tons), and the total amount from the catch is \$213,901. In fact, Arno fishermen have gained \$213,901.00 for the period. The total weight of fish sale to the Majuro market is 260,782.2 *lb.* (119 tons), as well as the total amount of fish sale is \$311,177.11. On this, the expense is only fish purchase from the fishermen, the other expenses are covered by OFCF's fund. Therefore, the balance

of AAFA fund is increasing every month.⁷ The balance of end of Dec. 1992 should be \$131,798.51. (OFCF 1993)

The draft report then lays out the conditions of the plan projections, that is, the prescriptive operating plan. Part of this plan defines MIMRA responsibilities: (1) project management, (2) fish marketing in Majuro, (3) project accounting, (4) managing facilities, equipment, and materials, (5) purchasing fuel, materials, and equipment as needed, and (6) paying the rents on the land used for the bases. The project will sell off the fishing boats, and current stocks of fishing gear and engine parts (and income from their sale) will last three more years. The project staff in Arno are listed and reallocated: the Arno base manager will be transferred from the project to the MIMRA staff and payroll, and the project will pay wages for only three of the four remaining Arno staff. The report lists the major fixed capital assets to provide the basis for later projections of costs. The report then notes that depreciation of facilities and equipment is not considered because of very high costs; worn equipment will be replaced with money from the Arno Atoll Fisheries Association fund (OFCF 1993).

The report uses this plan to project an annual profit and loss statement (Table 1). Figures for fish purchases and sales are drawn from actual figures for the year from October 1991 to September 1992. Table 1 shows revenues of \$160,474 and expenses of \$143,333, projecting an annual profit of \$17,141. In Table 2, these figures are projected forward for ten years, with the costs of replacing worn-out equipment added in lieu of depreciation. This calculation yields a projected loss over the ten years of \$43,190. But this loss can be covered by interest earnings on the capital fund. If \$100,000 of the association fund (projected to stand at \$150,000 when MIMRA takes over the project) is invested at 7 percent compound interest, over ten years it will generate interest payments totaling \$96,715, sufficient to cover operating deficits, and the project capital will actually increase by \$53,525.

In this report, critical boundaries define what is project and what is not-project. I will offer an alternative accounting based on a reexamination of project boundaries and cash flows. Take the allocation of labor, which assumes a boundary between the project and its management. The OFCF plan reassigned the Arno site manager to the staff (and budget) of MIMRA and says that only three of the remaining four Arno staff will remain on the project budget. It may be they thought the Ine assistant expendable. As he was from the family of the Ine base landowners, however, discharging him was not a real option. In the end, all employees were retained on the association payroll. The plan also assigned various tasks to MIMRA with no charges to the project for these services. Marketing and materials supply took one man full time, bookkeeping and payroll and marketing assistance engaged

TABLE 1. Profit and Loss Projected by OFCF (U.S. dollars)

Revenue	160,474.00
Fish sales	116,189.00
Fuel sales	29,165.00
Ice sales	10,320.00
Fishing gear	2,400.00
Outboard parts	2,400.00
Expenses	143,333.00
Fish purchase	78,564.00
Fuel	41,349.00
Gas	25,812.00
Diesel	9,333.00
Two-cycle oil	5,184.00
Four-cycle oil	1,020.00
Materials purchase	6,000.00
Labor	17,420.00
Balance	17,141.00

Labor Detail			
Position	Base	Percentage	Yearly
Ine manager	240.00	100	6,240.00
Jolok operator	230.00	100	5,980.00
Chief engineer	200.00	100	5,200.00
Labor subtotal			17,420.00

another person at least one-third time, and supervision and management for the project was a major responsibility of the chief fisheries officer, which I estimate conservatively at one-quarter time.

Other expenses were also left off the books and outside of the project definition. I do not have hard figures on these but will make rough estimates. Land rents, based on the government standard of \$3,000 per acre and eyeball estimates of one acre per base, may run about \$6,000 annually. Depreciation, it was acknowledged, was not considered. The OFCF plan provided for replacement of vehicles and generators, but not buildings. Ignoring the costs of surveying, site preparation, dredging, and so forth, I estimate the replacement cost of the buildings at \$100,000 and figure depreciation over a life of forty years.

Regarding fish purchases and sales, a brief examination showed that no calendar-year total matched the period chosen as the basis of analysis, and statistical analysis showed the fish purchases from fishermen to be almost one standard deviation above the mean of the rolling average yearly catches.⁸ Fish-

TABLE 2. Profitability for Ten Years Projected by OFCF (U.S. dollars)

Year	Revenue	Operating Costs	Equipment Replacement	Total Expenses	Yearly P&L	Balance
Opening capital						150,000
1	160,474	143,333	0	143,333	17,141	167,141
2	160,474	143,333	0	143,333	17,141	184,282
3	160,474	143,333	0	143,333	17,141	201,423
4	155,674	143,333	28,000	171,333	-15,659	185,764
5	155,674	143,333	28,000	171,333	-15,659	170,105
6	155,674	143,333	41,000	184,333	-28,659	141,446
7	155,674	143,333	12,000	155,333	341	141,787
8	155,674	143,333	0	143,333	12,341	154,128
9	155,674	143,333	24,000	167,333	-11,659	142,469
10	155,674	143,333	48,000	191,333	-35,659	106,810
Sum	1,571,140	1,433,330	181,000	1,614,330	-43,190	

TABLE 3. Profit and Loss Projected by Author (U.S. dollars)

Revenue	153,304.00
Fish sales	109,019.00
Fuel sales	29,165.00
Ice sales	10,320.00
Fishing gear	2,400.00
Outboard parts	2,400.00
Expenses	168,879.00
Fish purchase	74,790.00
Fuel	41,349.00
Gas	25,812.00
Diesel	9,333.00
Two-cycle oil	5,184.00
Four-cycle oil	1,020.00
Materials purchase	6,000.00
Labor	38,240.00
Depreciation (buildings only, 40 years)	2,500.00
Land lease	6,000.00
Balance	-15,575.00

Labor Detail			
Position	Base	Percentage	Yearly
Arno manager	240.00	100	6,240.00
Ine manager	240.00	100	6,240.00
Ine assistant	160.00	100	4,160.00
<i>Jolok</i> operator	230.00	100	5,980.00
Chief engineer	200.00	100	5,200.00
Marketing	240.00	100	6,240.00
Bookkeeping	260.00	33	2,230.00
Fisheries chief	300.00	25	1,950.00
Labor subtotal			38,240.00

ing intensity, fish stocks, and success rates are highly variable, and it seems more justifiable to me to base long-term projections on a mean than on an opportunistic sample.

My accounting is shown in Table 3. Rather than a yearly surplus of \$17,000, there is a deficit of over \$15,000, roughly 25 percent of fishers' earnings. Projected over ten years (Table 4), this deficit accumulates to a difference of more than \$320,000 from plan estimates. As deficits eat up capital, interest earnings would be lost. In this scenario, either the project would collapse in five to six years as capital equipment wore out and could not be replaced, or the project would require ongoing government subsidies.

TABLE 4. **Comparison of Ten-Year Projections (U.S. dollars)**

Year	OFCF Projection		Author Projection	
	Net Revenue	Fund Balance	Net Revenue	Fund Balance
Open		150,000		150,000
1	17,141	167,141	-15,575	134,425
2	17,141	184,282	-15,575	118,850
3	17,141	201,423	-15,575	103,275
4	-15,659	185,764	-48,375	54,900
5	-15,659	170,105	-48,375	6,525
6	-28,659	141,446	-61,375	-54,850
7	341	141,787	-32,375	-87,225
8	12,341	154,128	-20,375	-107,600
9	-11,659	142,469	-44,375	-151,975
10	-35,659	106,810	-68,375	-220,350
Close	-43,190	1,595,355	-370,350	-204,025

From another perspective one might ask: How much has the project benefited fishermen and their families in Arno? The draft report notes that “the total amount from the catch is \$213,901,” paid to fishermen. The payments made to fishermen were immediately reinterpreted as a “gain” to fishermen, leaving out the costs they are charged. Through the same period, the report shows other income (i.e., not from fish sales, but sales of fuel, ice, and gear) as \$34,322 (OFCF 1993). These charges were implemented gradually, but by 1992 they amounted to 28 percent of sales. Allowing for sales of gas and ice for nonfishing use, costs were running at 20 to 25 percent of sales. Based on the mean of the yearly rolling average, Arno fishermen could expect to earn about \$74,790 from fish sales with expenses of \$16,469, for a net of \$58,321, not counting depreciation of the motor and boat, a substantial cost where a \$3,000 outboard has a life expectancy of about five years. With 1,787 residents in 217 households in Arno at the time of my census, net earnings come to about \$33 per capita or \$269 per household. Of course, not all households participate equally in the selling of fish; some benefit more and some less. I will not cover this variability in this discussion.

To place these figures in context, the per capita GDP of the Marshalls is about \$1,600 (OPS 1990). Cash figures are more meaningful in urbanized atolls than in Arno, but this level would serve as a reference point for evaluating cash incomes. In Arno, the other main sources of cash income from production (as opposed to wage jobs) are copra and handicrafts. Copra earnings in this period averaged over \$300,000 per year (*Marshall Islands Journal* 1994). Handicraft earnings for Longar, Arno, the one islet where I could get reasonably complete information, were about \$8,000 in 1993. Projecting total

earnings from Longar, with 10 percent of the atoll population, suggests handicrafts could bring in as much as \$80,000 per year. I think it is clear why Arno people offer mixed assessments of the benefits of the fisheries project.

There is yet another perspective to consider: opportunity costs. If the capital invested in the project had been put to another use, what kind of return could have been earned on the investment?⁹ Using the same 7 percent figure employed by the OFCF report, and taking only the Japanese International Cooperation Association investment of \$4 million in Arno, annual interest payments would come to \$280,000, better than five times the annual earnings of the fishermen. Despite the presumed rationality of metropolitan aid agencies, it seems possible that something other than economic development is at stake here.

Political Economy

No one has gone to the Marshalls primarily to help the natives.¹⁰ German companies sought copra and trade, while the government decided colonies were an important symbol of a modern nation. Japan sought to expand its economic catchment and political hegemony. The United States originally pursued strategic concerns, but economic interests expanded as fishing fleets moved into the western Pacific. Each nation in turn sought to establish a long-term colonial association with the Marshall Islands to achieve its ends. With the fading of colonialism, other means may be sought to form the desired association. Fish are the material resource in the Marshalls most desired by metropolitan nations, and aid is one means to secure access. When the Forum Fisheries Agency succeeded in 1987 in negotiating an agreement with the United States that would guarantee Pacific Islands nations payment of about 9 percent of the market value for fish caught in their waters, the American Tunaboat Association refused to pay the full amount. The United States agreed to pay the balance from its aid budget (Nero 1997a; Crocombe 1995). Japan uses its aid as a lever to prevent island nations from forcing it into multilateral negotiations for fishing rights, preferring to play off one state against another (Rix 1990). Aid is not primarily aimed at economic development but is structured to serve national interests and support politically important constituencies.

Other studies document how development projects often carry assumptions about gender roles, technological efficiency, what counts as economic activity, and how to behave rationally that are imported from the sociotechnical milieu of the donor country. The Arno project bought into a common analysis or "social representation" (Lemonnier 1993) about boats that "subsistence technology means subsistence production" (Mike McCoy, pers. com.,

1993). Consultants from industrialized nations may take as an article of faith the concept of "efficiencies of scale" and assume efficiency is equivalent to substituting capital or fossil fuels for human labor. It is tempting to assert that such beliefs, in conjunction with a need to make a donation adequate in comparison with Japanese fishing activity in the Marshalls, led to the disjunction between the scale of investment and the level of returns in the Arno project. I do not have the data that would let me take this idea beyond speculation.

I could also offer another speculation, noting that the Arno project, for continued operations, depends on ongoing subsidies from the government. As the fiscal basis of the government is not local production but overseas transfer payments, the project acts to maintain the very dependence on those payments that development is presumed to counter. A Republic of the Marshall Islands capable of exploiting its own marine resources, without the participation of overseas fishing fleets, would threaten politically effective interest groups in the donor nations. The overseas donors have interests in maintaining continued associations of dependence. Indeed, I heard expatriates in Majuro speculate that the high level of Asian Development Bank loans to the Marshalls was aimed at securing the support of the government in international political fora; in this construction the Marshalls' vote in the United Nations is a valuable resource, and the aid establishes a form of international debt peonage. Yet I am not in a position to argue that the project was structured purposely to maintain relations of dependence.

Another line of reasoning would, rather than assume a hidden agenda, recognize that the fisheries of the industrial nations are highly subsidized and assume that fisheries agencies of those countries reproduce what they know best. The Japanese and U.S. governments distribute aid monies to support their fisheries sectors. Worldwide fisheries are heavily subsidized at \$54 billion per year, in an industry with catches valued at \$70 billion per year (Sutton 1996).

Beyond the Project

As I have shifted the boundaries of the project, adding larger sets of economic relations, the view of whether the project is sustainable and what is being sustained has likewise shifted. Now I wish to look beyond the project, to view it as a waystation on a path rather than a singular event. History matters, everybody makes missteps, and perhaps the best perspective on the Arno Atoll Fisheries Association is not whether it in itself met all the goals one might desire, but rather to ask what it contributes to the people of the Marshall Islands.

Here I want to emphasize the project as a critical site for learning. While industrialized cultures may emphasize formal and specialized educational institutions, for most people learning comes in the context of observing and doing, and the project provided many opportunities for observing and doing technical, economic, and social practices (see Lieber, elsewhere in this volume). Fishers learned new techniques of fish processing. With more mobility they learned more about the habitat and fish resources of the atoll. They may have learned as well that outsider-financed projects will push the mode of economic relationality favored by the donors. As fishers increasingly bypass the project markets established in Arno, they increase their direct knowledge of the Majuro market, while learning to employ their relationally based exchange networks to channel fish in new paths outside their residential communities.

Learning is also taking place in MIMRA. Indeed, this was expected—the Arno project was often referred to as a pilot project, an initial step in larger plans to expand the outer islands' commercial possibilities. In making financial projections, I have been a bit disingenuous, accounting as if MIMRA would follow the OFCF plan. In fact, MIMRA made adjustments. The authority not only retained additional employees, it also maintained wages at lower levels. Fish were originally categorized into two groups to set prices; MIMRA expanded that to five categories to better match market conditions. When staffers realized how popular the *Jolok* was as transport between atolls, they accommodated social desires to capitalist economic logic by charging for passengers and goods. Nor were fish stocks ignored; the project would not buy certain fish when a decline in species abundance or size was believed by managers to be serious, and a plan to bring more motorboats to Arno at the end of the OFCF phase was dropped. With the knowledge also gained from the history of the Majuro fishing cooperative, MIMRA staff now have two data points on the effects of fishing intensification on coral reef fish stocks.

Learning also shows in the design of the second phase of the fisheries project, again an association of MIMRA, the Japan International Cooperation Association, OFCF, urban markets, local fishers, national politics, and international interests. Arno Atoll Fisheries Association figures show that fuel was second only to fish purchases as an operating expense for both the project and fishers. The new project uses solar panels instead of generators to make ice. Fishbases were built on three atolls, and one transport boat rotates buying trips among the three, spreading out fishing effort and minimizing impacts on the stocks. Instead of bringing in motorboats, fishers are expected to rely on locally acquired or built boats. Each fishbase was equipped with one boat to use in distributing supplies and collecting catches around

the atoll, saving fishers the necessity for fuel and motor to cross the lagoon. The atolls Alinglaplap, Namu, and Likiep are far enough away from the target market in Ebeye that capturing the production of the fisheries for the project will not be a problem.

The new project functions in new contexts and will bring new problems. Managers and employees will have to develop their understandings of the physical, social, and economic factors linked together in fisheries development, and often the most dramatic learning will occur when mistakes are made, when misunderstandings are most clearly illuminated. From this perspective, questioning sustainability from a focus on the development project is not wrong, but it can lead one to neglect a larger picture.

Associations, Development, Islanders

Parallel to anthropological studies of development, sociologists of science and technology have developed systems and networks approaches to technology. Works such as those by Law (1987) on Portuguese navigation and Hughes (1987) on electrical utilities emphasize the heterogeneous assembly of physical, intellectual, political, and environmental entities. Callon and Latour have elaborated this approach into actor-network theory (Latour 1996). Disavowing distinctions between the social and the technical, between artifacts and actors, they argue that technologies are created through enlisting entities in a “seamless web” of associations, a process Lansing (1991) calls “sociogenesis.” A successful actor-network must be robust enough to withstand forces that attempt to disassociate entities from the network, regardless of whether the forces are normally understood to be social, environmental, or technical. Lieber (1994) explores the decomposition of socio-technical networks. In development projects, as Koenig (1988) makes clear, the risks of disassociation are high, for the people tasked with creating the new networks are already coupled into other networks of government agencies, contractors, and consultants. These ties endure beyond the project and, through long associations and affinity, are usually stronger than their ties to the supposed beneficiaries of the project.

Creating robust associations is best accomplished by people with a strong commitment to the outcomes. And commitment will only come when the projects serve people’s goals. What can be learned about the development goals of Arno people? What options have Arno people chosen in the past, when they had the power to choose?

Status is important in Pacific Islands societies. Knowledges are reevaluated as shifting contexts open alternative paths, often to new positions of status. Formal education, introduced by missionaries and colonial powers,

became highly valued as a path to gain access to new positions of status created in churches and governments as well as new possibilities for diversified production and consumption. Further, Hess, Nero, and Burton (n.d.) show that Marshallese readily recognize the systematic distribution of costs and opportunities across linked geographical locations in their regional branch of the world economy. Elders and dependent children are shifted to outer islands where the costs of reproduction are supported by the subsistence economy, students are sent to schools in urban centers and abroad, while workers of employable age concentrate in the urban sectors of the Marshalls and the United States. They accomplish these shifts by using existing linkages of family and kinship, and creating new ones through personal ties and transnational institutions. They use economic resources arising from both transfer payments from the United States and the natural-resource endowments of their environment. These resources may be used to support vital exchange relationships, or they may be converted to cash used to pay school fees and living expenses of students at home and abroad. The students usually turn into wage earners in urban areas and broaden the family's resources and possibilities.

In some cases, then, people may choose to convert their natural resources into alternative forms that can be deployed in new arenas of performance. Sometimes it is economically rational to deplete a resource and reinvest the proceeds where they can earn a higher rate of return than can be obtained from sustained exploitation of the resource (McCay and Acheson 1987). This strategy may be applicable in the Pacific Islands states, where costs of transportation and factors of scale and skills and limited resource endowments make economic development particularly difficult. Dahl (1996) compares the investment decisions of the Marshalls and Kiribati. The Republic of the Marshall Islands went into debt on the theory that borrowed capital would develop the economy and generate future returns. Kiribati invested the capital it received in overseas financial markets and finances government with the interest, no longer depending on aid for this purpose. Similarly, Palau's compact provided US\$66 million up front, which it invested in overseas financial markets, and Tuvalu has set up a similar kind of fund. Dahl argues that such investments implicitly recognize the limited development possibilities of microstates, the governments choosing to invest in overseas financial markets instead of forming capital locally, and that migrants' remittances can also be viewed as income from foreign investment.

There were problems with development in the Marshalls other than the choice of strategy.¹¹ The choices made by Kiribati, Nauru, Tuvalu, and Palau, however, are challenges to the received paradigms of development by agricultural intensification, industrialization, and tying one's fate to world com-

modity markets. Wiseman argues that Tuvalu's choice may offer an alternative model for sustainable growth particularly applicable in smaller Pacific countries (1993). Kiribati and Nauru received the monies used to create trust funds as payment for massive and devastating resource extraction. If this is a viable choice, it may place policy makers on the horns of a dilemma: what do they wish to sustain—*islands or islanders*?

This is probably a false dichotomy. In the past, islanders have found flexible strategies that mix various kinds of production with investment in acquiring skills and knowledges and in building and maintaining relationships to be the best way to adapt to a variable and often harsh environment. Few may envy the position of the people of Nauru (Pollock 1997), figuratively sitting on a big trust fund but literally sitting on lands stripped to the bones of the coral it is built on. I think it likely that these flexible and multiplex strategies will continue to serve islanders and their interests in their future development, and sustainable production based on the islands' natural-resource endowments will be a necessary component of those strategies.

Conclusion

In this article I have constructed three of many possible accounts of the Arno Atoll Fisheries Association project. In the first account, which focuses on resources and monetary cost and benefits, the project is not self-sustaining. In the second account, focusing on international relations, the project sustains these relations of power and dependency, and models of industry/government relations as well. In the third account, I suggest that evaluation should take into account history, process, and the costs of knowledge rather than settle for facile assessments of success or failure.

"Development" is a concept constructed in international political rhetoric and practice, and the paradigmatic example of a development project is still an infusion of outside money, policy experts, technical advisors, managers, and materials acting in conjunction with governmental agencies to transform local social systems of production. The call for "sustainable development" arose in response to the often massive extractive and destructive efforts of these coalitions of interests. While local groups are not innocent of destructive practices, such as cutting down forests (Shankman, this volume) or the destruction of fish and habitat by use of poisons and explosives, there is the danger that the concept of sustainable development may be turned into another rhetoric of domination, insisting on the perspective of the outside expert or imposing restrictions on developing nations that donor nations reject within their own competing economies. The idea of "sustainable development" may lead analysts to think in concepts such as equilibrium,

homeostasis, or the ahistorical ethnographic present. As such, it lends itself to being applied in ways restrictive to dynamic, adjusting societies in changing circumstances.

“Sustaining islanders” calls for us to focus on the people, to let them judge the trade-offs between different values. The Marshallese emphasis on education and diversification may reflect a reasonable assessment of the limited possibilities of expanding primary production from the land and sea and be more realistic than all the development plans of the experts. They work to increase their range of options and their abilities to make adjustments (see Lieber, this volume), to balance homeostasis with autopoiesis. The challenge of development is to enhance the power of people to achieve their goals through access to tools, resources, knowledge, and decisions.

NOTES

Research for this article was funded by a Fulbright-Hayes fellowship and a grant from the University of California Pacific Rim Program. Versions of this article were read by Mike Burton, Michèle Dominy, Mike Evans, Michael Lieber, Eve Pinsker, Paul Shankman, and Charles Stevens.

1. Light manufacturing, such as garment factories, was also encouraged by favorable tariff policies negotiated as part of the Compact of Free Association.

2. Early estimates for the Marshalls usually place total population at around ten to fifteen thousand people, which probably represented the long-term carrying capacity under subsistence horticulture of tree and root crops.

3. Also, access to the lagoon and near-shore waters of an atoll is held in common, and some even say that traditional tenure extends to joint control of archipelago waters by the collectivity.

4. The government marine-resources agency went through several reorganizations and name changes between establishment in 1979 and my research in 1993–1994.

5. The project has been called various names; for simplicity I will refer to it by the current name, the Arno Atoll Fisheries Association.

6. I base this discussion on the draft report, as I never saw a final report. I acknowledge the possibility that it was revised later.

7. This balance is money accumulated from sales less the cost of the goods sold; this is not a profit, as many project expenses are paid out of the OFCF operating fund, and the two funds are kept separate.

8. I dropped the first year as well as the year following the departure of the OFCF advisors as unrepresentative. Both modifications raised the mean figures for purchases and sales, reducing the difference between my figures and the plan's, so my figures seem defensible.

9. I look only at the opportunity cost for this use of the capital and not at alternative allocations of fishers' time or of the fish themselves.

10. See Hanlon 1995 for an analysis of U.S. development projects in the U.S. Trust Territory of the Pacific Islands.

11. I think it likely that the path chosen, taking on debt to create future returns through investment in business, is only likely to work when one knows the business well. It would make sense for Ford to borrow \$100 million to build a new car factory but not to develop biotechnology. I have argued above that learning is a necessary part of the process, and the Marshallese have about two generations of learning to do before they are ready to become a nation of private enterprise.

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IS TONGA'S MIRAB ECONOMY SUSTAINABLE? A VIEW FROM THE VILLAGE AND A VIEW WITHOUT IT

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The development implications of the now-classic MIRAB economic pattern for South Pacific microstates (with economies dominated by overseas remittances and foreign aid) have attracted considerable attention. Some scholars argue the MIRAB pattern is well entrenched and can be sustained with a minimum of undesirable social and economic outcomes. Others decry the acceptance of the dependency of South Pacific nations and argue for renewed effort toward the development of self-sustaining economies. I argue that the debate must directly address the underlying social relations that facilitate and shape migration and remittances. In Tonga, the movement of people from rural areas has wide-ranging implications. Not only does the underuse of outer-island resources exacerbate levels of dependency, but the inability of outer-island migrants to participate effectively in traditional exchange activity could cause the deterioration of social ties that channel and promote the remittances on which the Tongan economy depends.

IN A DISCUSSION OF SUSTAINABLE DEVELOPMENT from a human-centered perspective, an initial question must be, just who is to be sustained? While questions about ecological sustainability are important ones, from a human-centered perspective, they logically follow the question of “who” is being sustained. This “who” might be conceived in terms of nation-states, or geographically specific populations, or people bound together into particular social institutions, and so on. As Michael Lieber (elsewhere in this volume) demonstrates, what X, what entity, what set of interrelated entities and practices we are talking about when we as scholars launch into a discussion of

sustainability counts for a great deal when we consider the content of the notion of sustainability.

Although this might seem a rather contrived place to start, such questions immediately arise when sustainable development is discussed. The assumption that the nation-state is the natural unit of analysis in discussions of development generally, and sustainable development specifically, is a key and contested one. The analytical framework provided by the MIRAB concept introduced by Bertram and Watters (1985) has been one of the most productive and, for those intent on conceptualizing development from a framework based on nation-states and national economies, one of the more disruptive in recent years. The MIRAB model stresses that the economies of South Pacific microstates are embedded in the regional and global economies in two main ways. The large-scale migration of islanders from the South Pacific to a variety of locations (most notably Australia, New Zealand, and parts of the western United States) has resulted in significant flows of cash and material from overseas migrants to kinspeople remaining in their natal areas (that is, *Migration and Remittances*). Foreign-aid donations have also resulted in the movement of large amounts of resources into South Pacific states and underwritten the development of sizable government bureaucracies (that is, *Aid and Bureaucracy*). Taken together the flow of resources through these two main channels has had profound effects on a number of South Pacific microstates.

The model shifts attention away from the classic focus of development,¹ that is, the growth of production within the nation-state marked and measured by things like balance-of-trade figures, to the stability of various sorts of transnational linkages. Some of these linkages fall under the purview of state institutions, while others are formed by and function through social linkages of islanders themselves. The key policy prescription potentiated by Bertram and Watters's treatment of MIRAB was the call for actions designed to stabilize things like labor markets and the movement of migrants into and out of these markets. Stability in transnational linkages rather than the development of capitalist enterprise in aid of national self-sufficiency was key. In fairly short order, Bertram (1986, 1993) linked issues of stability to those of "sustainability." It is in this vein that this article takes up issues of development in the South Pacific.

Using material derived from fieldwork in the Ha'apai region of the Kingdom of Tonga, I explore the effects of the MIRAB economic pattern on the social relationships in a rural village and the extension of relationships founded in village life to a transnational frame. In the village context, the "who" (the various configurations of emotional and material connections between villagers) is formed within the framework of Tongan culture. The

“who” are in turn directly related to the “how” of development for Tongan villagers. Migration of socially connected, not economically individuated, Tongan persons is one of the ways that a range of activities and social groups centered in the village are extended over vast spaces and significant periods of time.

While the migration/remittance process is not in itself antithetical to the continuity of long-term transnational relationships, other elements typical of the MIRAB pattern may be. In particular the centralizing tendencies inherent in the use of aid funds for the development of national bureaucracies results in both unequal pressure on ecological resources and unequal access to the material conditions necessary for the long-term replication and negotiation of transnational social ties. Such a perspective locates part of the source of the MIRAB pattern in villages (see James 1991) but ironically suggests that villages themselves may dissipate into wider regional systems and thus erode the kin groups and villages on which the current situation is founded.

MIRAB Economies in Polynesia and the Pacific

In 1985 Bertram and Watters put forth the thesis that the processes of economic change in several Pacific nations have operated in a manner that has suppressed agricultural intensification.² Overseas migration and remittances, foreign aid, and the growth of government administration have provided other, more economically attractive alternatives to agricultural growth, although the rationale for aid and administration remains “development” in the classic sense (*ibid.*:514). The postwar flows of resources from remittances and aid have created the conditions for increased consumption levels in spite of a lack of economic “rationalization” in the agricultural sector. Individuals operating in this context make rational decisions that do not entail persistent agricultural innovation (see also O'Meara 1990). Bertram and Watters speculate that the levels of consumption thus achieved could not have been reached through agricultural growth (1985:510); the implication is that these levels cannot be achieved by development geared to national self-reliance either (see also Acquaye and Crocombe 1984). This argument was originally directed at very small states like the Cook Islands and Niue, where the number of island-born people who reside outside of state boundaries is sometimes greater than the actual residents (see Bertram 1986:813), but it has since been applied to other microstates as well (see, for instance, Hooper 1993; James 1991, 1993b; Shankman 1990). Connell writes that this situation “is viewed with concern and dismay by many in [these] countries” because it “has nothing to do with self-reliance” (1986:49). Bertram and Watters (1985)

suggest that the situation is not reversible via agricultural development and that, rather than fitful and frustrating efforts to achieve self-reliance, policy-makers should turn toward ensuring economic stability (*ibid.*:515–516; see also Ogden 1989:371).

The place of kinship and social ties in MIRAB economies is central. It is important to note that the stability of the situation is dependent on remittances and aid. The flow of remittances is ensured in MIRAB economies by the continuity of the stream of migrants and by the long-term strength of ties between migrants and their remaining kin. Transnational kin ties knit migrants to their homelands in a variety of ways (see Marcus 1981). The continuing connections between migrants and their kin located within sending communities, embedded in traditional culture, ensure continuing emotional ties even where the intent to return permanently is lacking (Macpherson 1985). For the most part it seems that migrants from Polynesia do not disappear into receiving societies even when the migration patterns are not circular (Brown 1995, 1996, 1998). Migration is linked to cultural continuity to the extent that the kin groups are (Bertram and Watters 1985:499), because migration helps maintain traditional social life in which kin groups are embedded. Social practices understood in traditional terms are both the motivation and the beneficiary of migration. Given the sheer practical limitations to agricultural intensification that bear on almost all of Polynesia to one degree or another, it is doubtful that current consumption levels could be met by any enforced program of national self-reliance, though such a strategy appears to be the intent of organizations like the World Bank (1991).

If one accepts the evidence marshaled by case studies like that provided by Stevens (this volume), these limitations are not, from the point of view of ecological sustainability, a bad thing. Stevens, dealing with the impact of squash pumpkin production on Tongatapu, discusses how mechanical plowing (a technology linked to economies of scale essential for production for the Japanese market) has potentially destructive effects on soil fertility almost immediately. In the context of discussions about development in Tonga, studies like that by Stevens provide a much-needed counterpoint to those of naive economists forecasting economic “takeoff” (for example, Sturton 1992) on the basis of short-term and apparently ecologically unsustainable export growth. Studies such as Stevens’s (and see also Shankman, this volume) are a reminder that examples of agricultural or fisheries intensification in pursuit of resources at the expense of ecological values are legion.

Together, the ecological limitations experienced by most South Pacific microstates combined with the economies of scale required to produce commodities for the world market, not to mention the sorts of transformations required to ensure surplus expropriation in a capitalist mode, present severe

limitations to economic development not only in the sense of increasing GDP, but in terms of environmental sustainability as well. So it is that scholars like Bertram and Watters have proposed that policy prescriptions drawn from the MIRAB model be used to promote pragmatic solutions to the challenges of development in South Pacific microstates in both the short term (stability) and the long term (sustainability). Bertram's (1993) reconsideration of the MIRAB model uses a practical general definition of sustainable development drawn from Pearce, Barbier, and Markandya (1990):

We take development to be a vector of desirable social objectives; that is a list of attributes which society seeks to achieve or maximize. . . . [We] suggest that sustainability be defined as the general requirement that a vector of development characteristics be non-decreasing over time, where the elements to be included in the vector be open to ethical debate and where the relevant time horizon for practical decision making is similarly indeterminate outside of agreement on intergenerational objectives. (Cited in Bertram 1993:247)

This definition has the advantage of demanding that we as scholars concern ourselves with cross-cultural variation in definitions of the desirable. It also is overtly concerned with time depth and thus shifts our focus from "stability" to "sustainability" (see Lieber, this volume). With this definition in mind, Bertram revisits the earlier conclusions drawn from the MIRAB model. The major thrust of his article is to suggest that the course laid out in earlier articles to ensure stability is also the one necessary to ensure sustainability. The key elements for sustainability in Bertram's framework are again "entitlement of island communities to rent incomes" through (1) access to labor markets overseas (whether legally or sublegally) and (2) continued aid donor willingness to "subsidize consumption levels" (Bertram 1993:257). This formula is fair enough as far as it goes, and Bertram ends on a very optimistic note, suggesting that the situation is not only stable but sustainable.

For the most part I will not deal with Bertram's estimation of the stability or sustainability of these transnational linkages as they are determined by the interaction of nation-states. Rather, I wish to return to a key factor in the movement of resources from overseas labor markets back into a MIRAB economy—and specifically the Tongan economy—that is, the origin and nature of the social ties that knit migrants to those who remain in the home islands. Bertram is also optimistic that these ties are durable. He writes, "As for the sustainability of the market factor linkages between island societies and the metropolitan economies, these seem likely to prove as durable as

the kin, village and island networks which currently mediate them. On their present showing, those networks will be a feature of the South Pacific regional economy for at least the next generation, and probably beyond" (ibid.:257). These "market factor linkages" are associated with social networks, themselves linked in a somewhat amorphous way to "transnational corporations of kin."

Transnational Corporations of Kin

This idea, first suggested by Marcus (1981) and subsequently coined by Bertram and Watters (1985), has come under scrutiny in recent years (James 1991; Munro 1990). Munro has several objections to the use of the term "corporation," but for my purposes here his main point is that the term is misapplied in the Tuvaluan context. Insofar as Tuvaluan corporations of kin exist, their actions are a product of a very different logic, or "diverging underlying rationales" (Munro 1990:64), from those of capitalist corporate enterprise. Multinational corporations, says Munro, are concerned with "economic individualism and capital accumulation," while Tuvaluan extended kin groups "are more concerned with reciprocity within the group" (ibid.). Bertram rejects this criticism and suggests that Munro's attempt to eclipse the phrase "transnational corporations of kin" "suffer[s] the deficiency of focussing rhetorically, on culture rather than economics" (Bertram 1993:255). He then goes on to elaborate a methodology and research agenda that completely marginalizes any consideration of culture in favor of a highly economic accounting of the "net worth" of dispersed kin groups. Such a program might effectively trace the flow of wealth but leaves unexamined questions of why wealth flows as it does. In effect, the description "transnational corporation of kin" is reminiscent of the sort of economics/anthropology so thoroughly disassembled by Sahlins twenty years ago in *Culture and Practical Reason* (1976). Bertram assumes that behavior can be reduced to economic rationality (itself an ideology) in a capitalist mode; this sort of accounting for behavior (pun intended) imposes an explanation that might make little sense to the actors involved.

Another and related issue raised briefly by Munro concerns just how "corporate," in a bounded sense, Polynesian kin groups are. This is a crucial issue; in order to calculate anything about any kin group, this group must first be found and bound analytically. If the analytical binding is too contrived, its heuristic value is in question. This problem is dealt with by Bertram (1993) by supposing such a group in a hypothetical manner, thus ignoring rather than overcoming the problem.

James (1991) discusses the utility of the focus on kin groups as corpora-

tions in reference to the Tongan situation. She suggests that it is unwise to apply the term "corporate" to extended kin groups in Tonga today (*ibid.*:3). Changes in the postcontact period, especially in terms of the role of corporate kin groups in the distribution of usufruct land rights, eroded the material basis of kin group corporateness (Gailey 1987:196–201; Maude 1965:53). The subsequent shift in land-tenure practices to individually held leaseholds combined with the effects of the introduction of European models of the family associated with the Methodist churches are frequently cited as the initial causes for the individuation or nucleation of Tongan kin groups (see especially Gailey 1987). It is generally held that these historical trends have been exacerbated by the increasing monetization of the Tongan economy since World War II (see, for instance, Bollard 1974; Cowling 1990; Maude 1965).

The wider process of kin group formation (of which the notion of individuation is a part) has been the subject of long debate in the literature on Tonga, especially the kin groups of commoners. From even a cursory glance at the work of people like Aoyagi (1966) or Decktor-Korn (1974, 1975, 1977, 1978) and some of the work of Marcus (1980), one can get some sense of the inability of structural analysis to describe Tongan kin groups adequately. Each one of these authors is forced to develop heuristic groupings of kin that do not directly correspond to conscious Tongan models of kin groups. The reason is simple—Tongan commoner kin group configurations are formed through kindred-based overlapping dyadic ties, that is, processes of individual interrelationship, not structures of interrelated corporate kin groups. These ties are formed and understood through the kinship ideology of *'ofa* (love and generosity), which fuses emotional and material interest. The flexibility of kin group formation that results is problematic for any straightforward investigation of transnational linkages formed through corporations of kin, for in fact the internal linkages are not of a corporate nature. With this clarification in mind, it is useful to return to James's treatment of "the migration/remittance nexus" in the region of Vava'u in Tonga (1991:2).

According to James, the movement of remittances into the village she studied in Vava'u was confined largely to remitters' immediate families and did not, for the most part, engage a wider circle of kin, let alone something reasonably called a transnational corporation of kin. James writes that "the most dependable remittances and the largest amounts of money return in the form of 'savings' for oneself and one's immediate family, rather than gifts for an extended family group" (1991:3). Even very close kin beyond the immediate family may not share directly when remittances are received from overseas. Thus James sees the distribution of remittances reflecting the increasing individuation of interest, a position opposed to the notion that kin groups

are maintained or enhanced through the migration/remittance process. Still, James is careful to show the tremendous variation in the patterns of individual relationships affected by the migration process. She suggests that remittances of cash may be declining while other means of mediating transnational relations are increasing. Of particular interest is her observation that far from inhibiting the production of agricultural goods and traditional wealth items, this sort of activity is flourishing both for use in village-based prestige exchanges and for the mediation of relationships with overseas migrants (ibid.:22). James makes no attempt to systematize the linkages between such activity and kin group formation. Rather she prefers to talk of the “immediate family” as the focus of the flow of cash, and social and kinship networks as the wider context in which this flow occurs. James goes on to suggest that besides the individuating tendencies of remittance receipt, “any ‘ethos of wider social contract’ . . . is in Tonga mediated by nationwide organisations, most notably the churches. Through the mechanism of the *misi-nale*, annual public ‘free gifting’, in the Free Wesleyan Church, for instance, some of the money coming from overseas may eventually be used for church building or educational purposes that benefit the wider community, but this is not necessarily part of the rationale for labour migration” (ibid.:5).

Material drawn from Ha’ano, however, suggests that while the direct material benefits experienced by villagers through church spending programs are not part of the rationale for migration, contributions to the church are. Church-based feasting and the material contributions that villagers make to the church are important elements in the process of kin group formation. In Ha’ano at least, these contributions are directly related to the migration and remittance process and, not coincidentally, to the formation of kin groups.³ Contributions made to churches, both in the form of cash donations and in terms of gifts in kind, are systematically linked to the wider ideology and practice of gift exchange. Gift exchange praxis, much of which is framed by church-based activity, is in fact the mediating term in the formation of both the “immediate family” and the wider social and kinship networks in which these families are embedded.

The Construction of Social Groups: *Famili* and *Kāinga*

As I have suggested above, Tongan kin groups (especially among commoners) are notoriously difficult to pin down. A brief discussion of the terms *famili* and *kāinga* will help elucidate this point. *Famili* is arguably the most significant term of reference within the Tongan kinship system today. Cowling lists the several meanings of the term as (1) any nuclear family; (2) the members of an individual’s natal household; (3) cognate kin, more correctly known as

kāinga; (4) the totality of an individual's kin, both cognate and affines; and (5) members of the group of relatives with whom an individual works most closely in producing craft goods or feast tables (*pola*) for special occasions, or who work together on a regular basis in agricultural production for household subsistence needs or for cash sale, or to whom an individual could go to borrow money or for other needs (1990:110).

In Tongan terms, *famili* can include a very large number of people, virtually all those to whom an individual is related by blood or marriage (definition 4 above), although in my experience such usage is uncommon. Generally the term is used for the first two and the last definition given by Cowling. As is indicated in definition 3, the use of the terms *kāinga* and *famili* overlap. Decktor-Korn draws a rather strict distinction between *kāinga* and *famili*:

Membership in the *kāinga*—if it may be called “membership”—is simply a matter of genealogical relationships; membership in the *famili*, although founded on kin ties, is defined by participation in the activities of the *famili*. While *kāinga* is mainly a relationship category, *famili* is an action group which supplies members' households with goods, labour, and personnel when they are needed. . . . While *kāinga* ties transcend local boundaries . . . the *famili* is essentially a localized group, most of whose members live in the same village. (1977:153–155)

This is a useful distinction and one with which many Tongans might agree in the abstract, although in common usage *kāinga* and *famili* are often used interchangeably, especially when referring to more-distant kin.

The preponderance of usage on Ha'ano Island is as Decktor-Korn suggests; a *kāinga* is an ideal ego-centered kindred, while *famili* is generally used to indicate those relatives with whom an individual has more active material and social interests in common (i.e., Cowling's fifth definition above). For individuals the most active material and social ties tend to center on their natal families (including families of adoption) and on their families of procreation. The terms *famili* and *kāinga* merge somewhat at the edges even in Decktor-Korn's formulation, however; *kāinga* relationships can be activated for specific and limited purposes, for example, in acquiring short-term access to garden land, and thus *kāinga* is not simply an ideal “relational category” (Decktor-Korn 1974:9–10; see Aoyagi 1966 for a similar formulation using slightly different terms).

Decktor-Korn, and most Tongans as well, usually use the term *famili* to refer to localized kinship-based social relationships that order and underlie

mutually reciprocal exchange activity on a daily basis. Decktor-Korn's central thesis is that Tongan social structure needs to be understood as a "loose" one, in which the relative freedom of individuals to exercise a range of choices within the kinship system results in the highly variable composition of social units at all levels. Yet she insists that *famili* be understood as a social unit, one based on sibling sets or the descendants of sibling sets (Decktor-Korn 1974:155). Furthermore, in Decktor-Korn's view, *famili* do not overlap (*ibid.*: 161); that is, they are discrete and exclusive at any one point in time, although membership tends to shift over time.

Cowling disputes this; she writes:

In my view no fixed rules should be formulated regarding the membership of a small kin-based group which co-operates on work tasks or which supports each other without question. Such alliances exist but the membership may simply be determined by the history of inter-household relations of kin while children are growing up, or even by how many people can comfortably fit in the room of a house to prepare food or make mats, or are affected by personal preference. (1990:115)

In fact, Decktor-Korn's position is not much different, for she well recognizes the heterogeneity of *famili*. She writes that "it must be understood that the criteria of membership in the *famili* are not at all rigid. A person could be affiliated with any *famili* to which he or she is able to claim a kin tie, even if the genealogical connection is not very close, provided it is accepted by the members of the *famili*" (1977:155–156).

The source of disagreement between Cowling and Decktor-Korn can be seen in this statement from Cowling: "Most individuals had a network of people to whom they would apply for assistance on various matters. Some of these members were kin and others were non-kin. In the case of kin the word *famili* was used as an *explanatory term rather than as a collective noun*" (Cowling 1990:117; emphasis added). Although Decktor-Korn realizes full well that *famili* are not terminologically recognized as collective bounded entities by Tongans themselves, she seems to hold that individuals nonetheless recognize and distinguish *famili* relationships from all other types, including those based on genealogical ties as close or perhaps closer than those within the *famili*. Yet it is clear from Decktor-Korn's comments on her methodology for determining *famili* membership that membership is an empirical question that should be determined by direct observation of exchange patterns rather than by direct questioning (1977:166). The problem here is that, while *famili* is a significant category of Tongan social reckoning,

a *famili* is not a social unit with defined boundaries, either over time or within any one temporal instant. As Cowling points out, the term *famili* is a description or explanation of relationship; *famili* is no more a defined social entity, corporate or otherwise, than is *kāinga*.

Cowling quite correctly points out that the last twenty years have brought considerable change (1990:117–118). Ha'apai especially has been severely depopulated by out-migration. For instance, the village of Ha'ano's population dropped from 380 in 1956 (Tupouniua 1956) to 148 in 1992 (Evans 1996: appendix 1). This depopulation has resulted in gender and age imbalances, and the fractionation of sibling sets. In the village of Ha'ano, if there were intact and exclusive *famili* units in the past as Decktor-Korn describes, they are largely absent now. Instead most households rely on an array of relationships rooted in kinship, neighborliness (called *kaunga'api*), and common church membership (*kāinga lotu*). Any or all of these connections may constitute the basis for the generalized daily exchange relationships that Decktor-Korn singles out as the defining characteristic of *famili* organization. Where genealogical and affinal ties may have once been the primary path through which particularly intense ties were formed, a considerably wider array of relationships perform the same function today.

The large-scale dispersal of conjugal pairs is especially problematic for understanding *famili*, for it involves transregional and transnational kinship linkages that disrupt the most restricted sense of the term (i.e., Cowling's definition 2; see above). Internal and external migration patterns have dispersed a large percentage of husband-wife dyads both within Tonga and beyond (Gailey 1992; James 1991). Temporary migration for the purpose of education often results in the separation of husbands (who often remain in the rural area to provide subsistence goods) and wives (who move with their children to be closer to educational institutions located in regional or national capitals). Overseas migration frequently separates nuclear family members as well.

Given that the conjugal bonds between wives and husbands are used to frame most (but not all) of the overt church-based focus on the household/*famili*,⁴ and given that significant remittances are reported to flow between conjugal pairs (see Gailey 1992; James 1991), there is a tendency to attribute a sort of corporateness, or at least unified purpose, to kin groups formed at this level. But, while individuals within a household/*famili* share *most* resources, they do not share all resources, and they do not have coterminous material and social interests.

Wives do not have the same social responsibilities, kinship connections, or kinship obligations as their husbands; marriage does not merge the *kāinga* of husband and wife. Contrary to Gailey (1987, but see also Gailey 1992 for a revised statement of her position), women have not been transformed into

wives and mothers alone but maintain roles, responsibilities, and privileges as sisters and daughters within their natal families throughout their lives; in a similar vein, men generally maintain linkages to their natal families regardless of postmarital residence choices. For instance, at the death of a parent or close kinsperson of the first ascending generation, a woman is responsible for the provision of women's wealth items for the funeral that follows. Her husband, however, is not expected to provide either livestock or garden produce. Rather, it is the woman's brothers who must take the lead in mobilizing the men's wealth required for the funeral. Husband and wife are never fully integrated socially, and the key to what common interests they do possess is not their marriage but their children. Given that a conjugal pair have separate responsibilities in relation to their own natal families, children are the clearest common focus within a marriage.

This entire discussion is germane in terms of the processes engaged within the "migration/remittance nexus" because there is no particularly good way to bound the individuals involved in transnational relationships through the identification of kin groups as such. This is as true of the use of household/*famili* or "immediate family" or "nuclear family" as it is of any other device. Kinship and kinship relationships are a vehicle or idiom through which resources may flow. Kinship is not determinate, but clearly it is significant. Rather than looking to the structure of kinship, however, one must look to its practice, or more correctly its praxis; in the intersection of interest, emotion, and the ideology of kinship are the patterns of village life and, not coincidentally, the patterns of transnational relationships.

Tongan Gift Exchange

The three core concepts that organize gift exchange are *'ofa* (love and generosity), *faka'apa'apa* (respect), and *fetokoni'aki* (mutual assistance). All kin, quasi-kin, and political relationships are expressed in some combination of these terms (see also Cowling 1990). For instance, the brother-sister relationship was and is of central importance in kinship ranking and interaction. Brothers have *faka'apa'apa* toward their sisters; the concept is expressed in an avoidance relationship and social deference of the brother to the sister. It is also expressed on ceremonial occasions materially in the giving of gifts from brother to sister. Sisters are *'eiki*, or of higher rank in relation to their brothers, and are treated as such. Similarly nobles (*nopele*) are *'eiki* to their political constituencies and are treated with *faka'apa'apa*. This relationship too takes the form of social deference and the material provision of gifts from the commoners to their noble. Conversely, the nobles should have *'ofa* (love and generosity) toward their people. A "good" noble treats his people

generously and demands things only occasionally and only for specific types of events for which nobles are customarily entitled to support from their people.

Fetokoni'aki is often singled out by Tongans as the defining characteristic of good *angafakatonga*, or the Tongan way of behaving. It is the quintessential form of generalized reciprocity and is often opposed to *angafakapalangi* (the European way) or *angafakapa'anga* (the way of money). Any and all social ties should be expressed through *fetokoni'aki*. Neighbors, fellow church members, friends, and all kinspeople should practice *fetokoni'aki*. To practice *fetokoni'aki* is to show mutual 'ofa; to fail to do so in appropriate situations or with appropriate people is to be without 'ofa and at best elicits pity, at worst contempt.

These three principles, 'ofa, *faka'apa'apa*, and *fetokoni'aki*, operate within the household/*famili* as well as beyond. At all levels of social organization, however, there is a degree of freedom in terms of what people actually do. The concepts and associated practice and attitudes, while patterned by the social and political system, are not determined by it. The realization, legitimation, and expression of social relationships occur through actions commensurate with the three principles, primarily through gift exchange. Gift exchanges occur as part of everyday practice and most intensely in the ceremonial feasting activity that punctuates village life. Like the kinship system, gift exchange practices are optative; indeed in any particular instance the two are inextricably linked. Potential social relationships are actualized and maintained by mutual exchange. Even in asymmetrical relationships, like those of commoners to royalty or the nobility, some degree of reciprocity is expected. Any relationship that is perceived to lack appropriate levels of reciprocity, either material or emotional, is said to make one *ngaue popula*, or work like a slave.

Church Ceremony and Gift Exchange

No treatment of Tongan society can ignore the significance of the various churches at all levels of Tongan culture. The integration of the Christian God into Tongan values and social practices is profound and ubiquitous (see Decktor-Korn 1974, 1977; Olson 1993; and see Gordon 1988 on the Mormon church). Notions of reciprocity are present in the context of people's participation in church. Of particular interest here is the importance of the household/*famili* as a ceremonial unit in reference to patterns of feasting and gift exchange organized within the churches.⁵

On Ha'ano Island, most ceremonial activity is organized through the churches. No ceremony or public event, even if it is not directly undertaken

by a church, is without some overtly religious elements and the participation of a cleric of some type; all marriages, funerals, birthdays, and civil ceremonies involve God and church through some earthly representative.

Most adult Methodist men are *malanga* (lay ministers); a man's acceptance of a *malanga* role is in fact the last step to social adulthood. For women adulthood occurs when she is married and has a child (either physically or socially); the latter usually coincides with her husband's ordination as a lay minister. Church ministers, called *faifekau*, are professional clerics appointed by the church conference to serve in a particular area. These ministers, both lay and conference-appointed, act as representatives of the church and God in the myriad social events that take place in the villages every year.

Directly church-based events are most intense at the very start of the year. On New Year's Eve each church holds a long, multisermoned service that ends at midnight. This begins 'Uike Lotu, or the week of prayer/worship. Beginning the following Sunday and continuing for the next week, church services, followed by either a feast or a "tea," are held morning and afternoon. During this week little occurs but worship, the preparation of food, and the consumption of food. At each service one *malanga* gives the sermon, and one of the families "answers" (*tali*) with a feast. Because of the sheer numbers of sermons given on New Year's Eve, almost all the families in the church are somehow involved in either giving a feast, receiving one, or in many cases both. Throughout the rest of the week feasts are given, but these feasts are for the entire congregation, and they tend to be much larger. During the rest of the year a number of church ceremonies and events are marked with feasts. Easter, Christmas, and Mother's or Women's Day, for instance, are all marked with feasts (sometimes more than one), which are provided by a particular family.

Feasting and the *Famili*: Gifts to God

All church feasting is part of a reciprocal relationship between God and human beings. Particular feasts are overt manifestations of individuated relationships in which a household/*famili* faces God and community, offers a sacrifice and, with the help of their guests, asks God to deliver blessings in return.⁶ In this process, the *malanga*, as the chief representative of God, acts as the focus for the ceremony and as the chief mediator between the household/*famili* and God.

On those occasions when a feast follows a church event, there is a common and consistent pattern of activity in all three Methodist churches represented on Ha'ano Island. In the days before a feast the household/*famili* prepares by harvesting root crops, rounding up pigs, and purchasing the

store-bought goods that usually accompany traditional prestige foods. As a general rule, the larger and more elaborate a feast, the better, although an overly ostentatious display might result in negative comments like "*fia lahi*" (wants to be big) or "*fia 'eiki*" (wants to be a chief). In order to gather the necessary goods and mobilize the required labor, the vast majority must recruit assistance from other households. Usually people who help with a feast are related to someone in the feast-giving household, but a kin tie is not sufficient in and of itself. Assisting households and individuals are drawn primarily from those people who normally (that is, on an everyday basis) practice *feitokoni'aki* (mutual assistance) with the feast givers.

The night before, those people helping with the feast will spend many hours butchering animals, preparing root vegetables, cooking other prestige foods (like octopus, fried chicken legs, taro greens and corned beef, lamb flaps, and so forth), and building a large underground oven to bake meat, fish, and root vegetables. The work goes on far into the night and usually requires a number of cooperating adults to accomplish.

After the church service, people are seated according to rank along the feast table. At the head of the table sit the '*eiki* of the congregation,⁷ the congregation minister, any high-ranking guests, and the *malanga* who gave the sermon, regardless of his or her relative rank according to other ranking criteria. Below these people sit the other *malanga* and adult men, followed by adult women, and then younger men, women, and children. Although food is relatively evenly distributed along the table, the very best foods are concentrated at the head. Beyond the very bottom of the table is the ranking man of the feast-giving family, who sits beside a large basket of food that will be given to the *malanga* at the end of the feast. The rest of the feast givers are arranged outside of the lower end of the table and will not eat until after the feast is formally concluded.

The feast begins with a prayer of thanksgiving and a blessing of the food. People then eat while they listen to the speeches that follow. The first speech is given by the ranking person (or a spokesperson) among the feast givers, who welcomes people, apologizes for the poor food, and then explains the reason for the feast. At this level the reason is not directly linked to the particular church event, but rather to the person or persons within the feast-giving group for whom the feast is offered. This person is usually, but not always, a child. The speaker asks that the congregation recognize the humble feast offered by asking God to bless the child and the family, and to bring them good things (e.g., success in school examinations, good health, and so on).

Subsequent speakers take up this request by speaking of the feast givers' laudable actions and devotion to family and community as evidenced by the

feast. They then ask God to help the family in the future. The speakers are generally (but not always) other *malanga* or respected adult men. The highest-ranking persons speak last. Usually it is the *malanga* who offers the final prayer. Where earlier speeches may have an oblique element to them, the final prayer includes a direct request to God for assistance to the feast-giving household/*famili*. The feast is then over, the guests leave, and the feast givers eat and divide up the remaining food for distribution.

For parents and children, feasting is one of the formal contexts in which their interrelationship is outlined. Most church feasts are given for the benefit of children. In one church the minister kept a list of the sermons and feasts given at New Year's. The list consisted of matched trios of names: first, the name of the *malanga*; second, the name of the head of the family answering the sermon; and finally, the name of the child for whom the feast was given. The child as beneficiary is an integral part of what the feast is about. The feast, then, is partly about a family's devotion to God and partially concerned with the relationship between a family and their child. By giving the feast, the participants show respect (*faka'apa'apa*) for God and love (*'ofa*) for the child. Their expectation is that both parties (that is, God and the child) will thus remain within a reciprocal relationship with the feast givers and each other in the future. Indeed, people have good empirical evidence for this expectation.

Education and the *Famili*: Gifts to Children

One of the blessings most sought from God for a child is educational success. There are material reasons why parents seek to ensure that their children succeed at school. Feasting is one avenue to this end. The other important gift that parents give their children, and another manifestation of their love for their children, is access to education. Households/*famili* devote significant resources to their children's education in both direct and indirect ways. Among the most significant recurring expenditures of cash that households/*famili* make are church donations and school fees. The provision of educational opportunities for children is an important aspect of adult responsibility, but it is not simply a duty (*fatongia*). School fees are one part of a long-term relationship of mutual caring, assistance, and responsibility that extends to the death of the parents and beyond.

The only overlap in kinship ties between husband and wife is located in the children they have together. Other kinship responsibilities have the potential to create conflict in the allocation of household resources, while resources directed toward children need not. Indeed, because children may

be a common focus for not only a conjugal pair but their separate kindreds (i.e., *kāinga*) as well, a couple's children can and do bring the two kindreds together in common cause.

As with large feasts, it is a rare household/*famili* that can manage the education of a child, especially a bright one, without the assistance of others. Again, even if access to cash is not a problem, access to all the other things necessary for a child's success are very infrequently available within a single nuclear family or even an extended family household. There are thus important linkages that extend beyond the household/*famili* and come into play in the education of a child.

To access educational opportunities beyond the primary level, children must leave the island of Ha'ano. Although some schools have boarding facilities, boarding a child is both expensive and for many people unsatisfactory, because the child will be lonely and have no one to look after her or his needs directly. For these reasons, many families are split between Ha'ano Island and the regional center of Ha'apai, Pangai. When children gain entry into a college (high school) on Tongatapu, even this option is eliminated. In some cases an entire household/*famili* may relocate to Tongatapu in spite of difficulty because of shortages in housing, land, and other economic resources. Others choose not to migrate. Instead they seek someone on Tongatapu who can care for the child while he or she is at school. Generally, this person will be a kinsperson.

The movement of a child to Tongatapu mitigates what tendency there might be toward nucleation of extended kin into nuclear families, because it provides a rationale for interdependence. Material flows from the island in support of the child and to the benefit of the people caring for the child. Pigs, fish, mangoes, and garden produce are periodically sent down to Tongatapu. While one of the reasons this flow occurs is that the child is there, nonetheless kinship ties channel and contextualize the exchange and serve to invigorate the relationships between extended kin. The pace and scope of gift exchange is not limited by the material ramifications of the child's board. What at one level may be considered a simple exchange of board for produce is considerably complicated by ties of affection and relationships of mutual aid that extend both backward and forward in time. Such ties certainly exist for the child, but also for the other people involved as well.

For the people of Ha'ano Island, kinship connections are one means to ensure opportunities for their children. The process through which the educational opportunities of children are insured plays into a whole complex of other relationships. These relationships do have material components, and one can see a certain practical logic at work, but this logic is no more deter-

mined by economic calculation than it is by kinship or kinship ideology; rather, the two intersect. The result of this interplay is not the elimination of wider social ties, but their maintenance.

Education and the *Famili*: Gifts from the Children

Education is one of the primary routes through which people from the outer islands can gain access to the resources of the state or wider regional economy. Employment in the state bureaucracy, standing in the church hierarchy, and some opportunities to migrate overseas are dependent on educational success. All three of these economic options necessitate migration from the village.

In the section above I discussed how educational success was linked to a chain of gift relationships drawing together children, their parents, their wider kinship networks, the churches, and God. Empirical evidence is available to all villagers that demonstrates the effectiveness of this chain of exchange. To a limited degree the differences among households/*famili* in material well-being can be attributed to remittances from children. The most striking demonstrations of wealth differentiation occur at the time of the large annual donations to the church (called *misinale*).

Misinale is organized nationally by each of the Methodist churches. Target donation levels and specific dates are set by the church headquarters. As the date draws near, people within the church begin to plan the feast that will accompany the *misinale* ceremony and actively search out the resources they will use for their donations. Individual households/*famili* usually make individual contributions. All the donations are made publicly, and the size of the contributions are called out to all present. The contributions are then added up and announced. The total *misinale* is considered to reflect on the local church itself, just as individual donations indicate something about individuals and households/*famili* within the church. Greater prestige is associated with large donations.

Misinale contributions are gifts to God. As such they are part of a continuing relationship between God and the givers. Elements of both thanksgiving and expectations of future blessings are present in the discourse in and around the *misinale* ceremony. The size of a particular household/*famili* contribution can be seen to reflect the vitality and viability of its relationships to God; that is, a large contribution indicates a more expansive relationship from both sides. A larger contribution implies more blessings, and more blessings imply a larger contribution.⁸

In the most general terms, the size of *misinale* contributions is related to the position of the household/*famili* in its life cycle in a fairly straight-

TABLE 1. Comparison of Remittances and *Misinale* Contributions, 1992

Type of Unit	Mean <i>Misinale</i> (in Pa'anga)	Mean remittances (in Pa'anga)	Number of Cases
All	488	728	29
With grown children	615	1,027	16
With school-age children	375	458	10
No children	188	33	3

forward Chayanovian way. The dependency ratio is generally highest while children are in school; this is true in terms of both cash and subsistence requirements. Children of school age require not only school fees, but also a healthy gift relationship with God, church, and community in order to ensure their success. Once children have finished school, they are available to help the family with subsistence production, market-oriented production of crops or fish, the production of women's wealth, or wage labor.

Cash can be acquired from a number of activities, but remittances are generally the largest source. There is in fact a rather striking relationship between remittances from migrants and *misinale* contributions. Given that a large proportion of remittances flow from children to their parents (55 percent in Ha'ano village), it is not surprising but it is nonetheless important that the levels of both remittances and *misinale* contributions are higher among those with children who have migrated out. Table 1 compares the mean remittances received and mean *misinale* contributions made among three categories of households/*famili* in Ha'ano village: those with grown children, those with school-age children only, and those without children. The ability to give large amounts at the *misinale* ceremony is related to access to remittances; indeed, requests for cash made to children or other relatives who have migrated out are quite often made specifically for the purpose of church donations.⁹

People also "help" others. This practice occurs within the ceremony, after the initial donation is made. The steward calls for *tokoni* (help), at which time people may come up and make additional contributions in the name of the initial donating unit. Usually these additional contributions come from friends and relatives from different churches. When a *misinale* follows a death, the *famili* of the deceased makes their donation in the name of the deceased as a *fakamanatu*, or memorial. On these occasions such *tokoni* can be very large and reflect the great importance of wider kinship networks mobilized at funerals.

The Sustainability of Transnational Kin Ties

The flow of remittances from children and others to villagers is, like the flow of material at feasts, a tangible marker of the love and respect between remitters and recipients. From within the household/*famili*, the relationship that starts with the social and economic activity focused on children is reversed (that is, reciprocated) as children in turn focus their social and economic goals to the benefit of their parents. Remittances are one of several ways in which children can show their love. Many of the younger adults who remain in the village show love by caring for the other material needs of the parental generation. Fishing, farming, domestic care, and the production of women's wealth are all ways of showing love to those who benefit from one's work. Remittances are remarkable in so far as they primarily take the form of cash, while these other activities tend to result in the production of subsistence and traditional wealth. All these forms of wealth, including cash, can be and are turned toward the reproduction of social relationships through the gift exchange process. At one level these relationships have undergone a historical shift and now center on smaller social groupings organized around the Christian ideology of the family and the now individuated land-tenure system. But this shift is embedded within a much wider ideology of mutual assistance among kin and a gift exchange system that continues to implicate wider networks of individuals and groups in the well-being of individuals, households/*famili*, and larger cooperating groups.

Migration is one way in which Tongans seek to help those who remain behind. Those remaining in the village have good empirical evidence to suggest this strategy is an effective way to gain access to resources beyond village boundaries. The processes of development in Tonga, of which migration and remittances are one aspect, must be understood in terms of the intentions and objectives of Tongans themselves. The relationship among *misinale*, church feasts, and remittances is one example of how gift exchange practice in the village affects the actions of Tongans both within and beyond the rural area. Although the household/*famili* is the focus of this sort of church-based activity, it should also be clear that the household/*famili* is not isolated by these processes. The ideology of the family embedded in church practice, while significant, does not negate wider social ties.

As James (1991) suggests, remittances are not generally, or at least obviously, dispersed among a large group of kinspeople. They are received and used by individuals. But in Ha'ano, unlike the situation described by James in Vava'u, remittances are not easily seen as serving an individuated savings function. Most remittances flow from children to their parents, but most remittances in fact go into either church donations or school fees.

Clearly, gift exchange praxis is significant in the motivation for remittances

and in their subsequent use. The question remains whether this praxis is either stable or sustainable. On a year-to-year basis, social and cultural factors being equal, the levels of remittances will almost certainly vary given changes in exchange rates, overseas labor markets, and the flow of new migrants (James 1991, 1993b). I leave it to others to discuss the likely trends in these areas and will concentrate instead on the sustainability of the social practices I have outlined above.¹⁰

The View from the Village

When viewed from the village, the migration-remittance nexus is embedded in a complex of gift exchange relationships. Relationships shaped in ceremonial contexts combined with everyday exchanges of food and mutual assistance are the very stuff of social ties. These relationships have grown to encompass the use of cash, but they also mobilize large quantities of traditional wealth items and subsistence goods (Brown 1995; James 1991). In Ha'ano, where there has been depopulation in combination with extensive informal landholding arrangements, access to land is well diffused, and thus so too is access to traditional wealth and the ability to feast. This factor in combination with the limited cash-earning opportunities people have is sufficient to allow almost all to participate more or less effectively in the intense gift exchange activity that typifies village life. Prestige, both individual and collective, is an outcome of this feasting (Marcus 1980), but so too are the multiple overlapping social ties demanded, facilitated, and enacted through gift exchanges.

These gift exchanges are not simply the manifestations of material interest or kinship ideology. In practice they are events that form emotional ties capable of spanning the globe. Remittance behavior is indeed individuated, but it is not necessarily individuating. Remittances find their way into circuits of exchange that, while sometimes focused through households/*famili*, engage wider social ties at a number of levels. The example of *misinale* donations I have given above is one particular gift exchange nexus that tends, because of the church-based ideologies it articulates with, to emphasize the household/*famili*. Other formalized gift exchange activities, for instance, funerals and celebrations around first and twenty-first birthdays, engage and outline a much wider network of kin and also use resources drawn from remittances (see, for instance, James 1991:18). In addition, a wide range of other informal exchanges ranging from the everyday movement of fish between households to the long-term transfer of usufruct land rights, like formal exchanges, link people together economically, socially, and emotionally (see Evans 1996).

It is not unreasonable to talk of an efflorescence of gift exchange activity

in Tonga (Marcus 1980; Maude and Sevele 1987; James 1991; see also Gregory 1982 for a general theoretical discussion). Remittances are crucial, but they are not the lone element in this efflorescence. Within the village of Ha'ano, the movement of cash into local exchanges is matched by the use of locally produced wealth. The exchanges of resources that create and mark social ties use all of these things in different and varied measures. Cash has not replaced the use of locally accessible goods in gift exchange but has been incorporated into and alongside of these goods. The mediation of social relationships continues to be dominated by gift exchanges and has not been subsumed into commodity exchange.

In terms of the sustainability of the transnational relationships identified by MIRAB theorists, a focus on the movement of resources transnationally bereft of consideration of the local praxis that codes meanings into these flows is hopelessly hobbled. The experiences of *'ofa* that inform and shape the behavior of migrants is tied not simply to their experiences of cash but to their experiences of a whole range of gifts. While it is possible that the dual role of cash as a gift and cash as the mediating instrument of alienating commodity exchanges produces some ambiguity in people's experience, this overlap is considerably less of a factor in the movement of other sorts of goods.

For the maintenance of transnational social ties between groups of people (not corporate but effectively collective at some junctures), the movement and experience of movement (that is, giving and receiving) of gifts between people is essential. Two questions arise: (1) are these emotional and material ties effective transgenerationally? That is, how long will these ties remain sufficient to motivate the movement of resources into Tonga and its villages? And (2), are conditions in the villages likely to continue to be dominated by the sorts of gift exchanges that give rise to the emotional and material commitments of contemporary migrants?

My own research and experiences are insufficient to marshal an answer to the first question. James suggests that even given the fairly widespread practice of the fosterage into rural villages of children whose natural parents resided overseas, these relations were too ambiguous to ensure sufficient connections between "second-generation remitters" (1991:16–17) and their kin resident in Tonga. Of the practice of transnational fosterage she writes: "I doubt in many cases that the Tongan notion of *'ofa* ('love, generosity') will be successfully instilled into the younger generation born of migrant parents. Instead they are likely to get more clearly the message of economic individualism, which seemingly dominates the actions of their parents and other relatives, which may mean that they will cut themselves off from wider kinship ties" (ibid.:17). Given the discussion above, it should be clear that I

have reservations about predictions based on "the message of economic individualism," for this does not coincide with my own observations based on work in Ha'ano. While the whole issue of transgenerational transnational linkages is a crucial one, the sustainability of remittance flows is also influenced by the continuing movement of first-generation migrants. This movement, in turn, is a process influenced by both state-managed transnational ties and individual social ties between Tongan overseas communities and their natal communities. However, I must leave these issues for other analysts and future times.

The View Without It

Rather, I will turn to the second crucial question (which is also a logically prior one). That is, are the social practices through which the social ties are forged in the village sustainable? Let me first reiterate my position that current village practice is neither individuated nor inevitably individuating. This position is based on my observations of the nature and vitality of gift exchange praxis. At root my argument is also based on the diffusion of the vital resources within the village; in particular, the noncommoditization of land is crucial. Access to the stuff of gift exchange is not equal, but it is widespread enough that, in Ha'ano at least, the vast majority of people can participate in gift exchanges and thus form the interrelationships central to subsequent transnational flows of wealth. But the MIRAB pattern also includes a distinct tendency toward the centralization of populations. Considerable population shifts are associated with the centralization of educational and employment opportunities in Tonga (Ahlburg 1991; Evans 1996; Maude 1965:87; Walsh 1970; see Sevele 1973 on the concentration of foreign-aid expenditures on Tongatapu). This fact is well documented for Tonga and presents some fairly obvious problems in terms of unbalanced population distribution resulting in ecological pressures on the main island of Tongatapu and the underutilization of land and ecological resources in outlying areas.¹¹

The structure of Tongan land tenure is such that both formal and informal tenure is today effectively dependent on kinship ties that internal migrants, who generally move to the main island of Tongatapu, may not possess (see James 1993a). Access to land, and thus crucial and otherwise largely noncommoditized resources, is constrained by the seemingly voluntary movement of people off their lands, rather than the more typical colonial and neocolonial patterns of land alienation and commodification. It is this aspect of the MIRAB pattern that may, in the end, be the most destabilizing and the greatest challenge to the sustainability of transnational connections forged

through village-level praxis. It is not the incorporation of cash into villages and relationships based in villages that poses the problem, it is the potential erosion of access to other forms of wealth for mediating social relationships that threatens the connectedness of Tongans. The irony of the situation in Ha'ano is that the migration patterns from the 1960s onward that alleviated stresses arising from ecological problems associated with population pressure have grown and transformed to the point where subsistence activities are threatened by radical depopulation. Potential losses in the subsistence sector not only aggravate problems brought on by dependency on overseas labor markets and imported goods but could well be disastrous for the social ties that facilitate transnational resource flows from overseas Tongans. Under such conditions both the stability and the sustainability of the MIRAB pattern are very much in doubt.

Conclusion

It remains, by way of conclusion, to put the preceding discussion more concretely into the wider consideration of the notion of sustainability as it is elaborated and contested by this and the other articles in this volume. Lieber's discussion of the advantages of an ethnographic approach to what and how any one X is sustained (or not) argues for the systematic explication of linkages between activities, institutions, ecologies, and the humans embedded within. This article is necessarily partial in that it holds steady some ecological factors in favor of a detailed consideration of social ones. With this limitation admitted, the article attempts to outline how Tongan social relationships, social groups, and social activities are systematically reproduced through Tongan exchange praxis.

The notion that exchange activities lie at the heart of social reproduction is an old one (Mauss [1925] 1990). While it is difficult and perhaps unwise to assign boundaries to the social groups reproduced by the exchange practices outlined, it is nonetheless vital to recognize that the sustainability of the MIRAB economic pattern is dependent on the reproduction of social relationships. The social activity of exchange is both a cause and an effect of Tongan theories of sociality; in other words, Tongan exchange lies at the center of Tongan praxis, a self-sustaining unity of theory and practice.

It is through the extension of this praxis beyond the political and ecological boundaries of Tonga that the limited ecological and economic potential of this small island nation has been overcome. The foregoing discussion thus resonates with the articles of the Micronesians in this collection insofar as it thus becomes clear that "sustainability" in the late twentieth century need not be bound to one arbitrary spatial unit. People and economies, and thus

ecologies, are bound together in a global system. Politically motivated demands that development be contained within the nation-state are neither practicable nor, for that matter, sustainable. The key difference between the Tonga example I have outlined and those described by the Micronesians is that the particular trajectory of Tongan history has allowed the development of a praxis relatively independent of the ideologies of other polities. Clearly, many of the polities of Micronesia face severe challenges because of their dependency on the United States. More specifically, Micronesian dependency on direct aid limits the ability to define what a sustainable interdependence might look like against U.S. claims that interdependence is "unsustainable." The current situation in Tonga is founded on the extension of Tongan identity beyond the boundaries of the nation-state rather than on policies designed to enhance a spatially contained nation through development policies based in self-reliance or self-sufficiency. Tongan villagers can act on an interdependence founded on social ties in juxtaposition to demands that the only interdependence that qualifies as "development" is that of market-based economic ties.

Social relationships founded in Tonga, between Tongans, and through the experience of reciprocity both mundane and marked, invigorate and shape the migration-remittance nexus. The sustainability of this nexus may well be affected by the interventions of migrant-receiving nations, and thus the cautions of people like Bertram and Watters need attention, but the desires and strategies of villagers need attention too. It is in the sustainability of their interrelationships, born and nurtured on Tongan ground, that ecological limitations and boundaries are dissolved. This nexus is viable only as long as Tongans at home and overseas can create, recognize, act, and react to their interdependence, their sociality, and their debts to one another.

NOTES

The research on which this article is based was generously supported by the McMaster University School of Graduate Studies, and the Social Sciences and Humanities Research Council of Canada.

1. I understand the term "development" in the classic, or perhaps better the neoclassic, sense (and its usage in this literature) to refer to processes that result in an increase in levels of market participation, capital investment, and productive activity in the pursuit of national economic growth.

2. In this they are in agreement with dependency theorists working through a model of development structured by the use of the nation-state as the central unit of analysis (Connell 1986; Shankman 1976; see Hayes 1991 for an excellent discussion of the construction and interrelationship between these two competing models).

3. James mobilizes data drawn from a village in the Vava'u region. I am about to dispute some of her conclusions on the basis of work I did in the Ha'apai region. I do so in full recognition that it is entirely likely that interregional variation underlies some of our differences. The recognition that variation within Polynesian polities has been elided in a great deal of work in the past (Huntsman 1995; Thomas 1989) is germane here. However, I can only recognize that regional variation is a potential intervening factor in my discussion and make no systematic attempt to account for it.

4. The term "household/*famili*" from here on will refer to this smaller, conjugally focused set of kin. This unit, which tends to be recognized overtly within church practice, consists of a senior married couple, their unmarried (or married and not yet reproducing) children, and occasionally other attached kin. I have constructed this compound term for a number of reasons: first, to distinguish the term from the multiple meanings of the term *famili*, and, second, to provide a term that incorporates transregional and transnational linkages within the household; I am thus including closely cooperating dispersed kin within this unit. Finally, I mean to draw attention to the term as a heuristic one.

5. My discussion focuses on the ceremonial calendar of the three main Methodist churches, known in Tongan as Siasi Uesiliana, Siasi Tonga Hou'eiki, and Siasi Tonga Tau'aitaina. There is variation among these three churches, but generally their practices and theological beliefs are quite similar. Although there were two Mormon chapels on Ha'ano Island and I did attend some services, I am less familiar with their annual cycle. Several other faiths are present in Tonga as a whole, and both the Catholic and the Mormon churches have practitioners in comparable numbers to the Methodist churches, but the state church (Siasi Uesiliana) and the other closely related Methodist churches taken as a whole are predominant.

6. I am indebted to Heather Young Leslie for pointing out that feasts are indeed referred to as sacrifice (*fela'ulau*).

7. This is the highest-ranking member of the congregation reckoned through the traditional political ranking system (that is, through blood rank) and its postconstitutional reformulation (that is, noble status—which sometimes, in fact, conflicts with blood rank). This person may be male or female; in Ha'ano village two of the three church *'eiki* are female.

8. For *'eiki* people, large contributions are also related to social rank. That is, the ability to give wealth in certain situations is linked to the legitimation of rank (see Morgan 1989; van der Grijp 1993:206).

9. Some migrants are reluctant to give money to their parents for church donations but would rather provide food and other store-bought items. This type of remittance has given rise to the practice of arranging a line of credit with merchants in the regional center of Pangai. A migrant will send cash directly to the merchant, who will in turn provide the receiving family with an equivalent amount in goods. In the one case this practice was followed in Ha'ano village, the old couple turned their children's intention on its head by taking food from the merchant and then using it primarily for church feasting.

10. But note that what data are available suggest that remittance levels are both stable and long-term (see Brown 1996, 1998).

11. In fact, in areas like Ha'ano growth in agricultural production is limited by shortfalls in labor, not land (Evans 1992, 1996).

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DEVELOPMENT, SUSTAINABILITY, AND THE DEFORESTATION OF SAMOA

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The forests of Samoa (formerly Western Samoa) are rapidly disappearing. This article reviews the history of Samoan deforestation, particularly during the last four decades, in the context of ideas about development and sustainability. It also examines the role of village agriculturalists in the process of deforestation. Recent economic, technological, and organizational changes have increased village agricultural expansion and, consequently, deforestation.

MORE THAN TWENTY-FIVE YEARS AGO, as the world was becoming aware of the planet's vanishing resources, *Natural History* published an article on the demise of the rainforests of Samoa and the role of an American lumber company—the Potlatch Corporation—in harvesting the hardwood stands of its islands (Shankman 1975). The article was critical of the corporation, and Potlatch was given the opportunity to respond. A corporate vice president assured readers of *Natural History* that conservation of forests was an important concern and that Samoans themselves were ultimately responsible for developing the resources of their country.

At that time not much was known about rainforests or multinationals. Anthropologists did not usually study these things. Concepts like “sustainability” and “the global economy” were still in their infancy. In the last two decades there has been much conceptual and theoretical progress as well as a great deal of actual research on tropical rainforests. But what has happened to the forests of Samoa?¹ Have they been developed in ways that have helped the Samoan people? Have they been a sustainable resource? Did Samoans become effective forest resource managers as the Potlatch vice president

anticipated? Or, has sustainability been a chimera and the forests a vanishing resource?

The answers to these questions, it turns out, are rather straightforward. The Potlatch saga was a compelling story, but it was short-lived. Potlatch left Samoa in 1976, and multinational lumbering did not play a major role in deforestation thereafter. Instead, the clearing of the forest has been due primarily to the rapid expansion of village agriculture. A good deal of documentation by both government and academic researchers suggests that in the near future there will be very little coastal and lowland rainforest left.² Only the higher-altitude and relatively inaccessible mountain rainforest and cloud forest may remain, largely because they are of little commercial value. Despite some noteworthy efforts at conservation and some isolated successes, at the present rate of exploitation, deforestation is a major feature of the Samoan landscape.

A recent report on Samoa by the Food and Agriculture Organization of the United Nations states that "if the present rate of depletion continues, the forest resources will be exhausted shortly after the year 2000" (1993:1). Geographer Gerard R. Ward, an experienced observer of forest trends in Samoa, notes:

Between the mid-1950's and the late 1980's the proportion of the total land area of Western Samoa which was under forest cover declined from 74 to 55 percent. While the resident rural population increased by 54 percent between 1956 and 1986, the area cleared of forest (excluding lava flows) increased by 73 percent over approximately the same period. Since the late 1980's, the rate of forest clearance is reported to be equivalent to the removal of almost 2 percent of the 1987 forest area per annum, with 80 percent of the clearing being the result of agriculture and other non-forestry activities. This is similar to the estimated rate at which the world's tropical forests generally are being cleared and, according to one Western Samoa Forestry Division estimate, triple that occurring in Indonesia. (1995:73-74)

In another cross-national comparison, the World Bank finds that Samoa has one of the most rapid rates of deforestation in the world (1996:86).

How did the large-scale deforestation of Samoa occur? This article reviews the history of deforestation, particularly during the last four decades, in the context of ideas about development and sustainability. These ideas have been the nominal bases of government policies that were to guide forest use over these decades. But such ideas may be less important than economic,

technological, and organizational changes at the village level, including changes in the Samoan land-tenure system, that have played a significant role in how the Samoans actually use the forest. I will also discuss how the international drama between a large multinational lumber corporation and a tiny independent country in the 1960s and 1970s gave way to a less riveting but more devastating process that illustrates the tragedy of the commons at the local level. Wider forces have had an impact on small-scale Samoan planters who, in turn, have responded by privatizing commonly held land and expanding village agriculture. Agricultural expansion is now the primary contributor to the deforestation of the islands. But before discussing these trends, some ecological and historical background may be useful.³

Forests in Pre-European Samoa

The forest species of eastern Polynesia are related to species from southeast Asia. Although the island forests appear lush and primeval like their continental antecedents, the evolution of these island forests has taken place largely in isolation, so Samoa's forests have fewer species than rainforests on the Asian continent. The Polynesians added to these fragile ecosystems, bringing with them significant "transported landscapes" of domesticated plants and animals (Kirch 1989), and thereby modifying the natural environment of the islands.

Pre-European Samoa was a society of dispersed villages surrounded by forest. Although there were larger political units, the village was the fundamental unit; political consolidation did not result in large centralized places. At the time of contact, Samoa's forests were largely intact, according to European observers (Olson 1997), unlike ancient Hawai'i, where large tracts of forest had been cut and burned for agriculture.

In Samoa, forest land was typically under village control, and new agricultural land was its most important contribution to human settlement. Agricultural land was cleared close to each village, and forests also provided timber for houses, fuel, and canoes. Wild plants were gathered for subsistence and medical purposes, and there was hunting of wild pigs and pigeons. Traditionally, Samoans spoke proudly of their particular forest holdings as having the best forest, the tallest trees, the most beautiful stands, or the best wood for house construction. Living immediately adjacent to the forest, villagers had a good working knowledge of forest species and their uses (Cameron 1962).

The exploitation of the forest was influenced in the pre-European era by Samoan cosmology. There were sacred places in the islands, including sacred groves, with *taulāitu*, or "priests," regulating their use. Samoans would not

cut these areas. European missionaries, determined to rid Samoa of superstition, cut trees to show Samoans that no harm would come to them. Olson cites a nineteenth-century Wesleyan missionary who came across a grove of commercially valuable timber that villagers refused to log because it was sacred, even though they were nominally Christian (1997:20–21). The missionary then cut down one of the trees to demonstrate to the villagers that there would be no supernatural sanction; the villagers followed suit. In this way, religious impediments to utilitarian use were overcome. Olson believes:

Pre-European-influenced Samoan societies effected maintenance of biological resources partially through cultural incorporation of a spirit world integrated in forest and sea. The potential conservation effect of Samoan spirit-nature relations diminished with Samoan adoption of Christianity. This is not to imply that pre-European-influenced Samoan cultural practices reflect a conservation ethic or intent. Rather, in the absence of associated spiritual constraints of pre-Christian religious ideology, Samoan cultural practices, past and present, suggest a more utilitarian than conservation or preservation basis. The difference refers to the degree of direct, consumptive use and sustainability between resources, as opposed to values and practices promoting the maintenance and protection of specific natural resource flows and ecological processes. In this sense, the current pattern of nature transformation in Samoa, the decline of active forests and living coral reefs, appears as an extension of material-economic practices devoid of the more symbolic-religious aspects of Samoan relations to forests and sea before the introduction of Samoa to Euro-American-Judeo-Christian constructions of nature. (1997:9)

In addition, the limited size of Samoa's population, the dispersed village settlement pattern, and the nature of indigenous shifting cultivation in pre-European times also played important roles in constraining the exploitation of forests.

Samoa's Economy from the Mid-Nineteenth to the Mid-Twentieth Centuries

In the nineteenth century, the islands of Samoa were viewed as a potential agricultural prize by rival European powers. By the mid-nineteenth century, large tracts of lowland forest on Upolu had been cut and replaced by foreign-owned cotton and coconut plantations. And before the century's

end, a visitor to Robert Louis Stevenson's home at Vailima warned Samoans to conserve their forests or lose them to foreign interests. But this warning was premature. Land alienation in the late nineteenth century and the first half of the twentieth century lessened, and the expansion of European plantations did not truly threaten the forests. At the same time, Samoans incorporated export crops into their own plantations, and village agriculture expanded accordingly. The islands' economic future seemed bright by the mid-twentieth century, although fluctuations in export prices, weather, and crop diseases were impediments to economic growth and although there had been a gradual overall economic decline until World War II.

After World War II, Samoa embarked on the road to political independence, which was realized in 1962. Apart from political sovereignty, though, there was the issue of economic vulnerability. Without a solid economic base, political independence would not mean much, and economic development would be problematic. As anthropologist W. E. H. Stanner bluntly commented in 1953, Samoa was in an economic category so "backward" that the problem was not simply encouraging development, but rather nurturing the very "preconditions" for development (1953:409). This sober assessment was disregarded, and the rhetoric of economic development was embraced.

During the late 1950s and the early 1960s, the seriousness of Samoa's economic situation was still a matter of debate. As New Zealand's colonial responsibility until 1962, the islands did not have to face problems of economic vulnerability directly, and there were experts who felt that better times lay ahead. The situation was not acute, as it rarely is in countries living under conditions of what used to be called "tropical affluence" (Fisk 1962). In such countries, underdevelopment does not entail the kind of poverty that is found in areas with severe land shortages, chronic food shortages, or high infant mortality rates and short life spans. In each of these respects Samoa was relatively well-off. The slow economic decline that had occurred over the first half of the twentieth century was not regarded with alarm because its effects were not catastrophic. Hope was nourished because reversals are possible in such economies, and since there was agricultural growth in the 1950s, continuing growth was expected.

Still, there were pessimists—those experts, both Samoan and foreign, who expected a change for the worse. They predicted that the conditions that had led to the long-term decline in the early twentieth century were likely to continue and that the expansion of the 1950s would be short-term. One prophetic analysis warned that a "combination of unfortunate circumstances in weather, plant diseases, pests, and poor world market prices for two or even three of the major crops would result in a financial crisis for the Western Samoan nation" (Gerakas 1964:32). But the optimists were not

deterred, especially in the popular press. In 1964 “Boom Is on the Way” headlined an article in the *Pacific Islands Monthly*. The same caption appeared in an editorial in *Samoaana*, a Samoan newspaper, on 26 January 1966. The opinion was offered that things were not as bad as they seemed: “In fact, indications are that this country is on the verge of a boom that in five or six years could transform its economy from that of subsistence to one of the most flourishing in the South Pacific.” The following week Western Samoa was devastated by the worst tropical storm in the South Pacific in seventy-five years.

The storm underscored the vulnerability of the economy in a manner that left few illusions. In the next five years (1966–1971), Samoa was to be visited by all the woes prophesied. Tropical storms struck in 1966 and again in 1968. The important banana industry, already decimated by bunchy-top virus, was virtually eliminated. The storms also curtailed production of the other two major export crops, copra and cocoa. When copra exports made a dramatic rebound in 1971, slumping world market prices reduced the value per ton to less than two-thirds of what it had been the previous year. Trade deficits persisted over the next twenty-five-year period, and balance-of-payments problems at the national level were common. Major exports such as copra and cocoa declined in value. And the devastating tropical cyclones of 1990 and 1991 further exacerbated the island’s economic problems as well as destroying substantial areas of the forest.

Economic Development, Forests, and Potlatch

As events were underscoring the seriousness of the economic situation, plans were being laid to develop the economy. In 1961, just before Samoa’s political independence, a Committee on Economic Development was formed, and in 1964 a Development Secretariat superseded the committee. Much of the support for the secretariat (known since 1965 as the Department of Economic Development) came from the United Nations Development Program, which had its regional headquarters for the South Pacific in Samoa. With the United Nations staffing the highest positions in the secretariat, this advisory group set about surveying the islands’ resources, determining planning priorities, producing a five-year development program, and promoting the idea of development among Samoans.

Following the completion of its surveys, the development group decided to emphasize improving conditions in the deteriorating village agricultural sector. Less emphasis was given to fisheries, tourism, and forestry. The reasons that forestry was given secondary attention can be found in an independent study by geographer Stewart Cameron, which reported that local

demand alone would put severe pressure on the rapidly diminishing lumber supply. Cameron found that "Western Samoa today possesses inherently poor forest resources which, unless rapid and coordinated preventative and remedial measures are taken, could disappear within two generations because of the ever-increasing demand for timber and cropland" (1962:77). This study concluded that large-scale milling and logging operations would be "impossible" (*ibid.*:66).

Cameron's study was especially important because it was part of a group of detailed studies designed to influence the newly independent country's policies toward land, resources, and agriculture (Fox and Cumberland 1962). Cameron stressed that, despite appearances, Samoa's forests were not abundant and would not be sustainable without immediate coordinated efforts to integrate village agriculture with forest conservation. Most significant, Cameron noted that village agriculture was the largest consumer of forest land. He hypothesized: "If the present haphazard expansion of land for agriculture continues, even allowing for renewed use, with fertilizers, and some land now in enforced fallow, in twenty years' time, with a projected population of 200,000, the major portion of the forest would cease to exist as a timber resource" (Cameron 1962:74–75). This analysis would prove remarkably accurate.

A separate study carried out under U.N. auspices in 1963 came to the same general conclusions about planning priorities, except that large-scale, commercial sustained-yield tree farming of tropical hardwoods was viewed as a feasible, though secondary, development possibility.⁴ It is this study that Potlatch cited as the basis of its efforts to help Samoa "launch itself into the mainstream of economic development" (Potlatch Forests 1971:3).⁵

Although the welcoming of private foreign capital had occurred much earlier, Potlatch would become the largest corporation ever to invest in Samoa. The 1963 U.N. study had recommended that Samoa take additional steps to secure outside capital. Yet this new policy contrasted with past policy and the wishes of many Samoans who were wary of European economic control. For example, in 1947, when Samoa was still under New Zealand mandate, a foreign furniture company was given permission to use Samoan timber resources. However, fearing that this case might set a precedent for further outside investment, Samoan opposition became so intense that the firm withdrew. The same cautious approach continued through the 1950s and 1960s and, in 1966, was extended to the negotiation of the Potlatch contract.

Local customary ownership prevented the government from granting timber concessions directly. But without the ability to lease necessary land, foreign investment could not be secure. Well before Potlatch, the Samoan government modified the law to allow limited leasing for commercial, indus-

trial, and tourist purposes. While this modification did encourage some foreign investors, it was not sufficient for Potlatch. By early estimates, Potlatch wished to lease between 100,000 and 160,000 acres of land on the island of Savai'i, or between 14 and 23 percent of Western Samoa's total land area (*Pacific Islands Monthly*, December 1968).⁶ For a transaction of this magnitude, the corporation found it necessary to request special leasing provisions that would circumvent restrictions inherent in the Samoan land-tenure system.

The roots of this system are traditional but were reinforced in the colonial era. After large parcels of land were alienated to European plantation owners in the mid-nineteenth century, Samoans became more aware of the need to control their land. In 1921, while under New Zealand mandate, Samoa's quasi-traditional system of land tenure was applied to 80 percent of the islands' land. Under this system, corporate family units in each village control multiple plots of land that are acquired through use. Land is jointly held by a corporate kin group, including family members in other villages who have a potential voice in land use even though they do not reside on it. Actual decisions about use lie with an elected family head, or titleholder, who, in consultation with family members and other titleholders in the village council, manage land use.⁷ If conflicts over land within families, between families, or between villages cannot be resolved, they can be referred to the national Land and Titles Court, an institution set up to handle just such disputes.

As long as land was abundant and was not a commodity, this system of communal land tenure was viable. It supported the Samoans adequately, and in the process, mastery of its labyrinthian complexities encouraged political astuteness among Samoan titleholders. As land became scarce, however, and as more commercial land-use alternatives were foreseen, the traditional system came to be regarded by economic planners as a barrier to economic development.

Potlatch ultimately wanted to invest US\$6 million in a timber processing plant, harbor facilities, and lease rights to Samoan forests. Commercial leasing and customary land-tenure arrangements were modified by an act of Parliament, which approved the Potlatch proposal in 1967 and paved the way for commercial leasing of timber rights. Potlatch began its operations in earnest in the early 1970s, but there were problems (see Shankman 1975, 1978), particularly unexpected expenses such as the dredging of the harbor at Asau for shipping. As specific concerns about the balance sheet emerged, Potlatch's promise of economic development was neglected.

This was Potlatch's first overseas venture, and by 1976, after only a short period of operation, the project was not profitable. So Potlatch left Samoa, and the government was left holding large loans and other commitments it

had made as part of the incentives package provided to the corporation. To offset the loss of Potlatch, the government entered a smaller-scale forestry joint venture with an Australian company.

What had been learned? While some of Samoa's forests had become available for export as part of the government's development program, the rhetoric of development and the economic realities of the project were at odds. Potlatch had promised to launch Western Samoa "into the mainstream of economic development" (Potlatch 1971:3), and the government had supported the project. Yet anticipated revenues went unrealized, and the practice of "sustained yield" forestry remained largely experimental. The result of Potlatch's departure was a major economic setback for the government. But it could have been worse. Potlatch itself had not irreversibly exploited the forests of Savai'i. In fact, so much attention had been paid to Potlatch that the actual deforestation by smaller mills and by Samoan villagers had been overlooked.

Potlatch was not the only commercial timber mill in the islands. Smaller mills existed before Potlatch and continued after Potlatch's departure, producing for the domestic market and for export. Potlatch's own large mill also remained in use after the company left. Their cumulative impact on the limited amount of merchantable forest was significant. As Ward notes:

In 1972 exports of timber began following the establishment of [Potlatch's] large mill at Asau which drew logs from the forest of western Savai'i. Several smaller mills continued to operate, largely for the domestic market. The peak production for local and export consumption was in the late 1970s and the early 1980s. It became clear that at current rates of logging the merchantable forest would all be cut out by about the year 2000 and the government imposed a regime involving reductions in the allowable cut. A ban on log exports was imposed in 1990 and then the export trade was brought to an end by the damage to forests caused by Cyclones Ofa and Val in 1990 and 1991 respectively. (1995:84)

The rapid decline of Samoa's exportable timber was accompanied by an increase in lumber imports and by increased milling for domestic consumption.

Sustainability, Development, and Village Agriculture

By the 1970s the government was initiating efforts to sustain Samoa's forests or at least to reduce forest losses. In 1974 the New Zealand Bilateral Aid Programme began providing funds for forestry research, development, train-

ing, equipment purchases, and reforestation efforts. A Forestry Division was established within the Department of Agriculture. In 1980 the Asian Development Bank provided a soft loan. Tree nurseries were established in three areas. Personnel were hired and trained. Other conservation projects included the establishment of a national park, the first in the South Pacific; four reserves; and, since the cyclones of the early 1990s, a Watershed Protection and Management Project.

The principles and objectives of the government's forestry policy were clearly enunciated in *Western Samoa's Fifth Development Plan: 1985–1987*. They were

- to maintain and establish where necessary areas of forest adequate to protect the climatic, soil and water resources of the country;
- to provide on a sustained yield basis the forest produce requirements of the people and to encourage an export trade; and
- to ensure the best use of all forest land for the general benefit of the country. (Department of Economic Development 1984:86)

The plan did not avoid the reality of deforestation; it stated: "Estimates show that at the current rate of removal . . . the bulk of Western Samoa's indigenous wood resources would be depleted by the year 1995" (ibid.:66). Yet the apparent disjuncture between the projected depletion of Samoan forests by 1995 and the desire to develop an export trade through sustained-yield forestry was not discussed in the report.

The 1985–1987 *Development Plan* was not unusual in its insistence on both promoting development through forestry exports and sustaining the forests themselves. But the numbers did not add up; there was a direct trade-off rather than a synergistic take-off. Moreover, the government recognized that the most significant contribution to deforestation was not coming from timber exports, although they played a supporting role, but from village agriculture and other domestic uses.

By the latter half of the twentieth century, many Samoans no longer lived immediately adjacent to the forest, and increasingly urban and peri-urban populations were less knowledgeable about particular species (Cameron 1962). Although forest land remained mostly under village control and still provided new agricultural land as well as timber for houses and fuel, gathering of wild plants and hunting of forest species were less common than they once were.⁸

The pressure to cut forest for new agricultural land has increased in recent decades owing to shorter fallow cycles, declining soil fertility, a growing population, and increased demand for cash.⁹ In the 1950s, for example, a

changing mix of these factors increased forest cutting on parts of Upolu (Farrell and Ward 1962:199). Older coconut trees were becoming less productive, and declining soil fertility led planters to seek new land. In areas where there was more volcanic rock, existing intensive cultivation and shorter fallow cycles also led to pressure to cut the forest. And new cash crops, like bananas in the 1950s, could require increased landholdings, although the failure of the banana boom in the 1960s left some land available for other crops.

More recently, pressure to cut virgin forest has intensified throughout the islands. In his study of Samoan planters in the 1980s, Tim O'Meara found:

With greater population pressure and more demand for cash today, people extend their land holdings by clearing most new taro plots from virgin forest. Seeing this primary expansion, planters now rush to clear the forest farther and farther from the village in order to claim as much new land as possible and thus avert land shortages for their families in the future. Some wealthy village planters even hire gangs of workers with chainsaws to clear land for them. The unfortunate result of this secondary expansion is that people replant only part of their old taro plots in coconuts—just enough to seal their long term claim to the land. Then they push higher up the slopes to clear more virgin forest. . . . As a result of this expansionary strategy, many families have far more coconut lands than they can currently work efficiently. (1990:62–63)

O'Meara also reports that a generation ago taro plantations were only about two miles inland, whereas by the 1980s new gardens were being cleared almost four miles inland on steeper slopes and at higher altitudes where taro does not grow as well (*ibid.*:69).

Additional trends also exacerbated village cutting of the forest for agriculture in the 1980s, which, along with other domestic uses, accounted for about 80 percent of the total cut (Ward 1995:74). A better system of roads pushed into the interior, making access to forests from coastal villages easier. And more people moved permanently inland, especially as water, including piped water, became easier to store. Rural electrification and the leasing of government land also contributed to movement inland.

Another important factor contributing to deforestation was the changing system of land tenure. As O'Meara has carefully documented, there has been a subtle but significant *de facto* shift in village land tenure toward more individualized holdings, giving titleholders access to more land and giving younger Samoans a greater share (O'Meara 1987, 1990, 1995). Since agricultural tenure involves use by right, those individuals and families able to cut more

forest and plant crops will have more land. The advent of the chainsaw made additional clearing easier, as Cluny Macpherson notes in his article "The Road to Power Is a Chainsaw" (1988). This new tool expedited deforestation. The newly cut land was often planted in taro, an emerging export crop consumed by emigrant communities of Samoans overseas as well as consumed and marketed domestically. As the value of copra and cocoa declined, taro became a popular replacement crop.

In the village in which I did fieldwork periodically from 1966 through 1984, these changes were dramatic. In the 1960s coconut palms were intercultivated with cacao trees and bananas, which in turn might border taro plants at the lowest tier of a multilayered agricultural regime. By 1984 much of the village had moved inland to the main road, and more land had been cleared by chainsaw for planting taro. The new land was easier to clear, plant, and weed, leaving older coconut and cacao plantations to fall into disrepair. Taro exports soared, but taro was vulnerable to disease and, in the early 1990s, taro leaf blight virtually eliminated taro production throughout Samoa. The new land that had been planted in taro was now planted with other crops that were not as commercially profitable or was left to lie fallow as people waited for the blight to subside.

Deforestation Nevertheless

From an environmental viewpoint, the Samoan pattern of establishing new gardens may seem less damaging than true commercial clear-cutting, a common form of logging used by multinational corporations elsewhere in the world. After the cut, Samoan domestic planting, coupled with weed growth and regrowth, holds soils more effectively than forest that is simply clear-cut and abandoned. In addition, much lowland forest in Samoa is on gentle slopes with porous soils, so erosion and runoff are less severe than might be expected. Yet the expansion of village agriculture was leading to deforestation nevertheless.

More forest was being cut than could be replaced by regeneration and reforestation. In 1993 the actual cut was almost twice the sustainable cut (World Bank 1996:74). It now seems likely that the fragile forests of these tropical islands cannot be regenerated, so the loss will be permanent. In addition, several already-endangered species are threatened. But these ecological concerns, so important to Western conservationists, are not likely to become as important to Samoans until the costs of deforestation become more evident on a practical level—with increasing distances walked for planting, firewood, and house-building materials or with increased monetary costs. Increased imports of wood and wood products may also lead to greater efforts at conservation.¹⁰

As Samoa becomes more affluent, the environmental costs of deforestation could be reduced by substitution of fossil fuels and alternative building materials for wood. And more money could allow for the purchase of food instead of reliance on gardens. These trends are occurring. In neighboring American Samoa, with its much higher income levels, gas and electricity, imported food, and concrete, hurricane-resistant homes are the norm. But most Samoans in western Samoa have not reached this standard of living and may not, because it is the result of massive American support for American Samoa. In western Samoa, many villagers still require forests for basic subsistence and other economic needs. And there is no guarantee that the rate of deforestation would lessen in the near future with increased income.

Because the expansion of village agricultural landholdings occurred during a period when agricultural export earnings were declining, Deborah Paulson, in her study of deforestation in Samoa, wondered what might happen to the rate of deforestation if global demand for village agricultural products improved. She states that

it is difficult to imagine what positive changes in the global political economy alone could slow or end expansion of agriculture in Western Samoa, as its peripheral geographic position limits its non-agricultural options (Ward, 1993). Improved terms of trade would increase crop prices and probably lead to more forest conversion. Better markets for a diversity of crops might produce more intensive and sustainable use of land that has already been cleared, but unless demand is controlled, there is no reason to expect better markets to prevent clearing of the remaining forest areas that can support crops (Boserup, 1965; Clarke, 1966). In fact, as people's financial situations improve, they could purchase vehicles which would make more distant, now-forested, land accessible for conversion. (Paulson 1994:329–330)

Village agriculture exports, though, have been eclipsed by Samoa's new economic ties to the wider world: foreign aid, migration, and remittances. The economy no longer relies on a growing agricultural export sector, even though it remains a primary development goal. Instead, over the last three decades, there has been a growing government sector supported by foreign aid, some new employment opportunities provided by private foreign investors like the Japanese auto parts manufacturer Yazaki, and rising incomes due primarily to remittances sent or brought back by the tens of thousands of Samoans overseas (see Evans, this volume, for discussion of such economic ties in Tonga).¹¹

Half of the Samoan population is now permanently abroad. Remittances, a major source of personal income for most Samoans, have allowed increased

local consumption without the limitations of low income ceilings imposed by village agriculture (Shankman 1990). By providing cash for locally milled timber, for new homes inland, for chainsaws, for vehicles, and for paying timber-cutting laborers, remittances and other forms of cash income may be contributing to deforestation. Thus, although agricultural land is being cleared in anticipation of future economic value, most Samoans will continue to rely more on migration and remittances as well as nonagricultural employment for a major portion of their income. Because village agricultural exports are unlikely to catch up with remittances and cash employment as an income stream, land may remain more valuable for subsistence and other uses than for export-based agricultural income.

Deforestation and Local Control

Deforestation in Samoa is not the result of a massive, singular assault; instead, it is the result of many independent family and individual decisions to extend agricultural landholdings farther inland and to establish claim to land that would otherwise go to others. The short-term benefits to villagers cutting the forest for land in anticipation of future subsistence and cash-crop production are weighed against the risks of not acquiring land when costs of acquisition are relatively low and opportunities to acquire land are relatively high. Land formerly held in common by a village now has become the property of families and individuals. The tragedy of the commons is occurring as the forest is privatized in piecemeal fashion.

Deforestation in Samoa has not been driven externally by ruthless multinationals, invasions of landless peasants and refugees, or exploitative landlords as is the case in much of the world. Local control has been affected by wider forces but has not been lost. Most Samoan villagers firmly believe that their acquisition of forest for agriculture is an appropriate use of their land. Paulson argues:

Unlike many places where local control of natural resources has been lost, Western Samoa's traditional land-tenure system survived the colonial period intact, and local government remains strong relative to national government. The traditional land-managers have responded to population growth, increasing material aspirations, and greater agricultural market opportunities with changes in the land-tenure system which have facilitated the conversion of forest to agriculture. (1994:329)

The Samoan case seems to run counter to the hope that local control will lead to sustainable use of forests. For example, in the 1998 edition of *State*

of the World: A Worldwatch Institute Report on Progress Toward a Sustainable Society, the author of "Sustaining the World's Forests" argues: "A proven way to reconnect costs and benefits of forest management is by returning—or devolving—control of forests to communities. Community control can improve the prospects for sustainability of the forests and the quality of life of people in or near the forest" (Abramovitz 1998:38). While this may be true for the examples from India that the author cites, it is not necessarily true everywhere. Very careful consideration must be given to the circumstances in which local control can promote sustainability and those in which it cannot. In Samoa, sustainability of forest resources has not been a priority for most villagers.

In the late 1980s, though, the remarkable efforts of ethnobotanist Paul Cox initiated a significant movement toward forest preservation and conservation at the village level. Using private foreign assistance to pay off a loan that would have otherwise required the cutting of forest on village land, Cox was able to work with villagers in preserving a large section of forest at Falealupo on Savai'i. A second village-managed reserve was established on the Tafua Peninsula (Cox 1997; Cox and Elmqvist 1991, 1997; Elmqvist et al. 1994). Regrettably, one of the tropical cyclones of the early 1990s badly damaged Falealupo village and its forest, but the projects are alive and well. The Falealupo Rain Forest Preserve in particular has demonstrated its attractiveness as an ecotourism site with its elevated forest-canopy walkway.

Cox and Elmqvist (1993) suggest that village control can be compatible with preservation of the forest while "ecocolonialism"—the imposition of Western conservation paradigms on indigenous people—may neglect issues of local knowledge and participation. The Falealupo and Tafua projects do involve local knowledge and participation. Yet Paulson wonders if such externally funded efforts may inadvertently commercialize the forest as villagers request cash payment up front for conservation efforts (1994). The potential for expanding this kind of preservation project remains unclear at the present time.

There is also an emerging Samoan environmental movement and an interest in ecotourism that could build local constituencies, which might increase conservation in the future. And, as noted earlier, there have been governmental efforts to sustain the forests of Samoa: the establishment of a forestry board with reforestation plans, a national park as well as four timber reserves, and the 1985–1987 *Development Plan* that explicitly addressed the need for additional conservation measures. Furthermore, the international environmental movement as represented in the South Pacific Regional Environment Programme and other regional organizations is creating a heightened awareness of conservation issues in Samoa. Yet taken altogether the above-mentioned efforts have not slowed the cutting of the forests. Even

though timber exports have now virtually ceased and the effects of indigenous deforestation are becoming more apparent, there is still no large-scale incentive to reduce further deforestation by villagers.

At the village level, forest cutting has increased in a competitive rush for future agricultural land. As cutting extends farther inland, family and village interests have come into conflict with government policies about watershed preservation. The government believes in forest reserves for the prevention of soil erosion, the maintenance of water supplies, and reduction of lagoon siltation. But villagers do not necessarily view the forest in the same way, and they hold tenure over most of it. The Forestry Division acknowledges the difficulty for villagers to accept a preservationist ethic if it means sacrificing their economic interests in acquiring more land. And for villagers, local autonomy and resistance to what they see as government encroachment are important considerations. Although some coastal villages can clearly see the problems of siltation and a reduction in lagoon productivity, inland villagers may not. So, although legislation has been passed to preserve watershed, many villagers simply ignore it and continue to cut.

Conclusion

Deforestation is occurring for a variety of reasons throughout the South Pacific (Barlow and Winduo 1997). In their summary of deforestation in the region as a whole, Clarke and Thaman conclude: "As there is almost no likelihood that forest loss in the Pacific will slow during the next several years—and perhaps not until loggable forests are cut and most agriculturally usable land now under forest has been converted to agriculture—the forests that remain are fated to dwindle away, their demise augmenting the worldwide spasm of extinction" (1997:122). Yet, as Clarke and Thaman point out, "Against this bleak scenario of deforestation and the extinction of biodiversity there exist possibilities for protecting and increasing biodiversity in the agricultural, village, and urban landscapes, even though at present there is also the tendency toward ecosystem simplification and the loss of biodiversity" (*ibid.*). They recommend a strategy of "incremental agroforestry" incorporating selected diverse, local species into village agriculture not for the sake of export, but to manage and increase biodiversity.

Incremental agroforestry is very different from the standard, development-oriented monocropping of imported tree species for export-oriented timber and agricultural development. Preliminary recommendations for agroforestry in Samoa have been made in a recent United Nations Development Programme report that inventories species, reviews practices, and establishes planning priorities. While this incremental agroforestry strategy does offer

an alternative to an “end-of-the-world” scenario for island ecosystems, to what extent it can work in Samoa remains to be seen. In 1962 Cameron recommended a similar “integrated” approach to village agriculture to no avail. Other solutions to deforestation in Samoa thus far have had only limited success.

In retrospect it is easy to see what might have been done for Samoa’s forests. Given predictions published in 1962, perhaps timber exports should not have been permitted, and immediate efforts to ameliorate the long-term effects of village cutting should have been undertaken. But this retrospective view does not take into account the everyday needs of Samoans or the actual relationship of government to villagers. Nor does it factor in the complex web of broader forces in which both villagers and the government are enmeshed.

For policymakers, the rhetoric of development was enticing for the newly independent country of (Western) Samoa in 1962, and the external financing of development institutions and programs gave it additional weight. Government definitions of sustainability were so flexible that they could accommodate recommendations for large-scale exports of timber even when sustainability and timber exports could not, in fact, be reconciled. Samoans themselves have been responsive to changing economic, ecological, and technological conditions. The short-term benefits of expanding local agricultural holdings were well understood, while the long-term consequences of deforestation were not. As it turned out, the concern in the 1970s over foreign exploitation of Samoa’s forests by companies like Potlatch was misplaced. Indigenous agricultural practices have been the major contributor to deforestation for decades.

The problem of sustainability facing Samoa today may not be specific to the sustainability of its forests or to developing “incremental agroforestry.” It may be broader and perhaps more basic—reducing economic vulnerability so that long-term interests and short-term priorities can be reconciled. Such abstract policy recommendations are easy to invoke but very difficult to implement. In the case of forests, much is known. What is not known is how to slow, halt, or possibly reverse the deforestation process. As a result, Samoa’s forests remain at risk.

NOTES

I would like to thank Art Whistler, Michael Lieber, James Hess, Paulette Foss, Paul Cox, and the anonymous reviewers for *Pacific Studies* for their helpful comments on this article. I also want to especially thank Tim O’Meara for his very careful reading of an earlier version of this article, for the many questions he raised, and for the many corrections that he

made. The interpretations in this article are my own. Earlier versions of this article were presented at the Association for Social Anthropology in Oceania meetings in February 1997 and February 1998 in the symposium "Sustaining Islanders" organized by Mike Evans and Charles J. Stevens. Research on Samoa's forests in 1969–1970 and 1973 was made possible by a grant from the National Science Foundation and in 1977 and 1984 by grants from the University of Colorado Council on Research and Creative Work. In 1997 Western Samoa's parliamentary government voted to change the name of the country to Samoa. In this article, Samoa refers to Western Samoa, not American Samoa. To clarify the island's geography and history, Samoa is sometimes referred to as western Samoa or Western Samoa.

1. There are actually several different forest zones in Samoa, each with its own distinctive ecology (Cameron 1962).

2. Among these sources are Cameron 1962; Ward 1995; Cox and Elmqvist 1991, 1993, 1997; Cox 1997; Cox et al. 1991; Elmqvist et al. 1994; and Paulson 1994. A more detailed discussion of Potlatch can be found in Shankman 1978.

3. This article reviews the deforestation of Samoa in terms of broad trends. Some of the finer detail that would be part of a longer article has been omitted here. Readers may want to consult the references cited for additional information.

4. This is the Stace and Lauterbach study (1963). Samoan expert J. W. Davidson gave the following assessment of this study: "Despite Stace's intimate knowledge of Samoa (and of the Pacific Islands, generally), the report that he and his colleagues produced in early 1963 was a disappointing one. Though it was issued in both their names, it consisted of two parts which they clearly drafted separately. These overlapped, and were to some extent, inconsistent. Much of the analysis was trite or woolly. Many of the recommendations seemed to reflect little more than a simple acceptance of ideas that were already in circulation. The work of the economists was later supplemented by more specialized studies by other United Nations experts; but these, too, mainly failed to relate fact and theory rigorously enough to provide a firm basis for a development plan" (1967:419–420).

5. The entire issue of this Potlatch publication is devoted to Samoa. In 1973 Potlatch Forests, Inc., became the Potlatch Corporation.

6. By 1973 Potlatch had leased 80,000 acres.

7. The Samoan system of land tenure and social organization is considerably more complex than is presented in this article. Such terms as "communal" land tenure and "extended family" are glosses for subjects that deserve much fuller explication. Among the more detailed accounts are Davidson 1967, Gilson 1970, Nayacakalou 1960, and Farrell and Ward 1962. O'Meara's recent work (1987, 1990, 1995) documents the individualization of this system. See Crocombe 1995 for an overview of changing land-tenure systems and sustainability in the South Pacific.

8. Flying foxes, however, have become a supplementary food source, and these animals were exported to Guam where they are regarded as a delicacy. As major forest pollinators, reduced numbers of the two species of flying fox could imperil forest regeneration (Cox

and Elmqvist 1991; Cox et al. 1991). In Samoa, one of the species is considered endangered, and both species of flying fox are under international protection.

9. Other factors may also be important. O'Meara discusses political factors that may lead villages and titleholders to allocate forest land to untitled persons (1995).

10. Of course, these arguments are largely hypothetical for the following reasons. Local mills may not offset imported lumber because they have a reputation for producing lower-quality timber. Moreover, the tropical cyclones of the early 1990s led to a questioning of wooden house construction and a favoring of cement block-based, metal-framed "hurricane houses." Increasing remittances allow for timber imports and more modern housing. But with fewer opportunities for migration and a possible lessening of remittances, coupled with reduced opportunities for government employment as a result of International Monetary Fund and Asian Development Bank policies, there may be less cash available for imports. With less migration and fewer government job possibilities, an increasing rural population may lead to further forest clearance at the village level.

Increasing economic stratification in Samoa has led to different strategies for different segments of the rural population. Thus, wealthier villagers do not walk to their plantations; they drive. They do not use much firewood because they can afford kerosene. They can increase their labor force temporarily by hiring others for forest clearance, and they can reduce some labor costs by purchasing herbicides for weed control. For poorer villagers, these strategies are less feasible.

11. Bertram and Watters (1985) discuss this pattern for a number of Pacific Islands economies.

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TAKING OVER WHAT BELONGS TO GOD: THE HISTORICAL ECOLOGY OF TONGA SINCE EUROPEAN CONTACT

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The New Zealand-sponsored banana export scheme of the 1960s and 1970s marked the first invasive agricultural techniques introduced in Tonga since its initial colonization. The scheme resulted in clear-cutting acres of old forest trees, tractor tillage, and fertilizer and pesticide application not previously known in the kingdom. After banana production ceased, introduced plant viruses remained, part of the hidden cost of doing business. The recent growing of squash for the Japanese market affords quick returns on farmers' labor investments and on the costs of intensive tractor tillage and costly chemical inputs. The monocropping of squash also results in desiccation, and compaction and acidification of soils; tractor tillage prevents the regrowth of deciduous trees, creates soil hardpans, and favors the infiltration of guinea grass in fallow fields. This article presents oral histories of Tongan farmers that document the replacement of sustainable agroforestry with farm-as-factory models of market-crop production.

Now, the act of a society remodeling the soil upon which it lives in accordance with its needs is, as anyone recognizes instinctively, an eminently historical event.

—Marc Bloch (1953:25)

THE COLONIZATION OF THE OCEANIC PACIFIC is regarded as one of the most remarkable accomplishments of humanity, and archaeological research has made great strides in documenting the process and the ecological consequences of that colonization. Islands are characterized by a relative lack of biological diversity and great spatial isolation. They therefore are seen as

fragile environments where ecological recovery from environmental damage may be protracted or impossible. Such environments would challenge the finest of agriculturalists bent on security of production. Yet, security of production over the long haul, without industrial inputs, is exactly what Polynesian farmers accomplished. The arrival of Europeans and the associated political-economic changes ushered in significant changes in land management. It is these historical changes, which are not well documented in the anthropological or geographical record of the Pacific Islands, that may represent the greatest alteration of topography, loss of biodiversity, and erosion of self-sufficiency since the initial colonization of the islands. This article presents the trends in land management in the Kingdom of Tonga since European contact.

A recent meeting of the Seventeenth Pacific Science Congress resulted in an edited volume that documents current archaeological understanding of the effects of human colonization of small and isolated land masses in the Pacific (Kirch and Hunt 1997). Kirch and Hunt's volume and other archaeological investigations in Oceania have gone a long way toward explicating the ecological disruptions that resulted from the transformation of islands from previously undisturbed natural environments into anthropocentric landscapes (see Steadman 1995; Steadman, Pahlavan, and Kirch 1990; Dye and Steadman 1990; Yen and Mummery 1990). While the original colonizers of the Pacific clearly had significant effects on the topography and biology (especially the bird life) of the islands they colonized, the islanders imported and rapidly established agroforestry systems that remained productive for as long as 2,500 years. These agroforestry systems represent impressively sustainable production systems despite the ecological attenuation of small oceanic islands and the destructive effects of colonization.

By the time the early Polynesians arrived in Tonga, they and their ancestors may have existed in oceanic environments for 7,000 years. Contemporary theories of the colonization of the Pacific describe a relatively rapid immigration of peoples from island Southeast Asia to the Bismarck Archipelago, where they incorporated aspects of indigenous Melanesian culture (including aspects of an independently developed Melanesian agroforestry) into their own distinctive Polynesian cultural and agricultural portmanteau (Yen 1990:265). At about 3000 B.P. there was a very rapid movement of people from the Bismarck Archipelago to Tonga and Samoa (Kirch 1997:17), which included the importation of some seventy-two species of edible and economically useful plants (Cox and Banack 1991:44–45). The colonists had developed an impressive cumulative knowledge of agroecology, and their skill at cultivation in circumscribed environments was considerable. The Tonga Islands, with their fertile soils, offered a particularly rich environment

for agriculture, and with some success, security of production over the long haul is exactly what many colonizers of Tonga managed to create.

The settlers brought with them what proved to be a very sustainable agroforestry, conditioned on some understanding of the productive limits of the environment. Population growth is presumed to have been maintained at small fluctuations around some optimum for a long time (Kirch 1984), and the reports of early European explorers depict well-maintained gardens and a highly productive agriculture. Whatever else these Polynesian farmers were doing, they seemed to be maintaining the productive capabilities demanded by social relations and necessary for surviving inevitable periods of scarcity. Polynesian farmers were extraordinarily skilled at imposing constancy of agricultural production on ecological systems more generally characterized by chaotic disruptions than by homeostasis.

Characterizations of indigenous islanders as guardians of nature have significant political ramifications (see Kirch 1997:19; Spriggs 1997:101–102; Trask 1993), but a clear conservation ethic was not evident among the Tongan farmers with whom I stayed for fifteen months between 1991 and 1993, and I found no evidence of nature or of agricultural production being closely linked to any religious beliefs. Moana, the volatile and unpredictable goddess of the deep ocean, had no terrestrial correlates. What Tongan smallholders are sustaining is duty and obligation, and agricultural resources are little more than a means of meeting these ends. The sustainable agricultural practices in the past may have been due to limits in population and technology as well as farmers' realization of the limits of the terrestrial environment. Environmental limits are less clear now with the availability of industrial inputs, and economic alternatives have enhanced smallholders' abilities to supply family needs and meet obligations to church, family, and state.

The agricultural system introduced by the first Tongan settlers was characterized by limited tillage, high cultivar diversity, intercropping and multi-cropping, the conservation of botanical diversity in the agricultural context, and the maintenance of rich soil. This regime contrasts in technique and in production with introduced banana and, more recently, squash cultivation for the external market, both of which require extensive tillage, monocrop production, and the addition of external inputs of pesticides, mildewcides, and fertilizers to produce a small variety of market crops that provide fast and potentially significant financial returns for smallholder agriculturalists. These two types of agriculture are the extremes of what is still a highly diverse agricultural system in Tonga, and the management techniques of farmers in the area of Nukunuku village on Tongatapu represent differential integration of indigenous and introduced cultivars, different fallow regimes,

and a host of partial and complete reliance on all productive alternatives available to smallholders.

Changes in agricultural management have been associated with decreasing yields and loss of soil fertility as farmers respond to increasing population pressures and demands for market-crop production. These changes are particularly evident since the 1930s, when population exceeded precontact levels, and since World War II, when the Tongan government sought to diversify agricultural production and engaged in agricultural development schemes with the aid of New Zealand (Needs 1988).

Precontact Land Management

The Tongan agroforestry system that impressed the European explorers was the product of a long migration history and process of agricultural experimentation by oceanic nomads with an extensive knowledge of island natural history. There has been increasing evidence of the efficacy of pre-European agricultural systems. Yen notes that "survival of crop plants [brought by the colonists] after landfall would be comparatively easy on high tropical islands" (1990). Similar sentiments have been offered by Ferdon, who suggests that early Polynesians were as competent in their horticultural expertise as they were at navigation (1987:205). In their migrations, the early Polynesians were traveling through a well-known island environment despite the endemism of island plant life.

Kirch (1984), Barrau (1961, 1965), Bellwood (1979), and Yen (1990) have argued that all subsistence crops were brought to the islands by the initial colonizers. Of the seventy-two species of plants brought to the islands, at least two dozen species and numerous varieties of crop plants appear to have been used by Tongan farmers (Fa'anunu 1977). Some of the more important plants brought to the islands and cultivated before European contact are listed in Table 1. No count of cultivar diversity was noted by European explorers, but the bush-fallow agricultural system was known to include yams, taro, giant taro, plantains, and sweet potato. Early ethnographic accounts note the presence of 121 varieties of yams (Whitcombe 1930). Of these varieties, 114 were still recognized and named by Tongan farmers in 1975 (Fa'anunu 1977), along with eight varieties of the lesser yam and eight varieties of giant taro. There were ten easily recognized and perhaps another fifteen less well known varieties of sweet potato and eight varieties of taro.¹ Many other plant species were introduced into the indigenous ecology for medicinal uses, but the plants listed in Table 1 are those that are known to have formed a significant portion of the subsistence of the early settlers (Thaman 1976: 46–75). Some of these, *teve*, the wild yam (*Dioscorea bulbifera*), and the

TABLE 1. Important Plant Species Introduced by Polynesian Colonizers

Common Name	Scientific Name	Tongan Name
yam	<i>Dioscorea alata</i>	'ufi
sweet yam	<i>Dioscorea esculenta</i>	'ufi lei
yam	<i>Dioscorea bulbifera</i>	hoi
yam	<i>Dioscorea pentaphyla</i>	lena
giant taro	<i>Alocasia macrorrhiza</i>	kape
sweet potato	<i>Ipomoea batatas</i>	kumala
taro	<i>Colocasia esculenta</i>	talo Tonga
breadfruit	<i>Artocarpus altilis</i>	mei
plaintain	<i>Musa paradisiaca</i>	hopa
plaintain	<i>Musa acuminata</i>	pata
banana	<i>Musa saientum</i>	siaine
coconut	<i>Cocos nucifera</i>	niu
hibiscus	<i>Hibiscus manihot</i>	pele
sugarcane	<i>Saccharum officinarum</i>	to
kava	<i>Piper methysticum</i>	kava
cordyline	<i>Cordyline terminalis</i>	si
Pacific aroid	<i>Amorphophallus</i> sp.	teve
paper mulberry	<i>Broussonetia papyrifera</i>	hiapo
arrowroot	<i>Tacca leontopetaloides</i>	mahoa'a
pomelo	<i>Citrus maxima</i>	moli Tonga
mango	<i>Magnifera indica</i>	mango
Tahitian chestnut	<i>Inocarpus edulis</i>	ifi
Pacific lychee	<i>Pometia pinnata</i>	tava
Polynesian plum	<i>Spondias dulcis</i>	vi
Malay apple	<i>Syzygium malaccense</i>	fekika
swamp taro	<i>Cyrtosperma chamissonis</i>	via
Indian mulberry	<i>Morinda citrifolia</i>	nomu

Source: Stevens 1996:316.

Pacific aroid, for example, were maintained in the agricultural allotments and were specifically reserved for use only during times of scarcity. The Tongan proverb “*Api fa’a toe tu’u ai a ‘e teve*” means “In the farm continues the *teve*” and refers to the wisdom of continuously maintaining in the bush those plants used only during times of scarcity.

Other species, such as the candlenut tree (*tuitui*, *Aleurites moluccana*), were introduced because of their utility for purposes other than as food; the candlenut, as the name implies, was useful because of its oil. Some species of pandanus (*fa*, *Pandanus* spp.) were not only used for making mats, sidings for houses, and sails, but also produced an edible berry eaten at times of scarcity. *Vavae* trees (*Ceibapentandra* Linn.) have silky seed-pod fibers used for

making bedding, and these large trees with light-colored trunks and branches were used to mark the boundaries and entrances to agricultural allotments. Lists and descriptions of indigenous and introduced species in Tonga are discussed in some detail by Thaman (1976, 1994), Clarke and Thaman (1993), Barrau (1961, 1965), and Kirch (1994).

Of the plants listed in Table 1, about ten had particular importance as subsistence crops, and some of these required significant agricultural knowledge for successful propagation and crop production. For some of these crops, particularly the yam, a great deal of indigenous agronomic knowledge and belief is associated with successful cultivation, and ceremonial significance is connected with its distribution and consumption. For that reason, there is significantly more information about the cultivation of yam than there is about the other staple crops in the Tongan inventory. Agricultural practices included, as well, a symmetry of gardening patterns still practiced by Tongan smallholder farmers, making their allotments pleasingly scenic and well ordered. Bananas and plantains, of which Anderson, Cook's botanist, noted eighteen varieties (Ferdon 1987:207), were planted in straight rows, each plant three paces from its neighbor, presenting a regular pattern of crop arrangement in which were similarly arranged giant taro and yam mounds (*ibid.*). This pattern was present for the planting of all crops except that the distances between plants was less for aroids, which were planted one pace apart.

The spaces between the rows of staple crops were occasionally filled by the *mahoa'a*, the Polynesian arrowroot (*Tacca leontopetaloides* [L.] Kuntz), and the plantations included *ifi* (Tahitian chestnut, *Inocarpus edulis*, J. R. and G. Forster), sugarcane, *si* (*Cordyline terminalis* [L.] Kuntz), breadfruit (*mei*, *Artocarpus altilis* [Parkinson]), and a host of other tree crops (shaddock, coconuts, Malay apple, Polynesian plum, lychee, kava) and nonedible but useful plants. Garden plots closer to the homesteads were filled with flowering plants, some of which may have had medicinal utility. Anderson observed huge monocropped groves of paper mulberry, coconut, kava, and bananas (cited in Ferdon 1987:209), and these may correspond to the large plantations grown for the higher chiefs by *fatongia* (duty or obligation), essentially *corvée* labor.

The agroforestry system in Tonga at European contact, and presumably before it, was clearly designed for agricultural production beyond that needed for immediate consumption, suggesting that "inherent" limits of the productive environment were not being reached. With maintained population limits and understood environmental limitations, the complex and highly productive system remained sustainable and self-sufficient well into the twentieth century. The pressure experienced by precontact Tongans to intensify pro-

duction was not demographic but social and environmental in origin. The evidence for Tonga suggests that population growth leveled off at some time, perhaps a millennium before European contact (Kirch 1984), and that population was not the primary spur to agricultural intensification as presented by Boserup (1965). The original Polynesian settlers to the islands were already socially stratified, and therefore population pressure alone was not the precipitating factor to hierarchical social organization in Tonga.

In average years, production in Tonga was adequate to feed the 30,000 or so Tongans scattered on 576.7 square kilometers of arable land on thirty or forty islands (fifty-two people per square kilometer). Bad years, where agricultural production fell and the taboos of the chiefly classes ushered in times of scarcity, may have amounted to population checks themselves. Uncharacteristic of intensive agricultural schemes generally, the fallow periods in Tongan agroforestry were longer (five years) than cultivation periods (three years) (Ferdon 1987). This property of Tongan agriculture and its particular form of high production and wide resource distribution may blur its classification as a type of intensive agriculture, but the activities associated with sustainable Tongan agroforestry through the middle of the twentieth century (multicropping, intensive preparation of planting material, limited tillage) are labor-intensive practices that are also associated with sustainable agricultural practices used by smallholders elsewhere (Netting 1993; Altieri 1995; Gleissman 1998).

The Nineteenth Century: Export Production and Smallholder Manumission

The nineteenth century in Tonga was characterized by a protracted civil war, the establishment of a monarchy patterned after the British parliamentary system, and the granting of rights to land to commoner males over sixteen years old. As Marcus notes, the Tongan Constitution established in 1875 was a "manifesto for a new world order in Tonga" (1978:515). Under this constitution, the majority of Tongans would be a landholding peasantry living under the statutory authority of a centralized government administration. This pattern differed dramatically from the decentralized social organization of a multitude of chiefs directing land management by heads of commoner families. The Constitution of 1875 detailed the rules of inheritance and succession and ultimately extended land entitlement to Tongan males, but it was the Act of 1882 that established the right of each Tongan male of tax-paying age to be granted a town allotment (*'api kolo*) in order to build a house and an allotment for agriculture (*'api 'uta* or *'api tukuhau*) of 8.25 acres. The constitution and the centralization of power in the Tupou line (the lineage of the

monarchy) simplified class relations into monarchy, nobility, *matapule*, and commoners in legal description. The number and variety of ranks and the associated authority and power they represented were reduced or eliminated in legal definition. Effective control over land was granted to the Crown, while effective tenure was given to commoners, and many chiefs, over time, lost their base of authority. These legal prescriptions allowed independent commoner land management, and, with increasing population, introduced technology, and monocrop market production in the mid-twentieth century, the stage was set for a categorically different trend in land management.

In the nineteenth century a number of crop plants were added to the list of introduced plant species, including cassava (*Manihot esculenta*), cocoyam (*Xanthosoma* sp.), papaw/papaya (*Carica papaya*), pineapple (*Ananas comosus*), peanuts (*Arachis hypogaea*), and a multitude of vegetables favored in the European diet (tomatoes, coffee, lettuce, cabbage, bell peppers, and so on) (Cook 1993; Sauer 1993; Thaman 1976). The only plants introduced by Captain Cook in Tonga that had any lasting influence were the pineapple and the watermelon, but less than sixty years after Cook, sometime during the violent period of civil war (1799–1852) that rewrote Tongan political organization, two substantial changes affected Tongan agroforestry: (1) the introduction of a number of plant crops including cassava, apparently around 1830, and the *Xanthosoma* taro and (2) the introduction of market sales of copra. The significance of the first event was not fully realized until perhaps as late as the mid-twentieth century, when population increases accompanied the replacement of taro and yams as staple crops with cassava and the slower replacement of *Colocasia* taro with *Xanthosoma esculenta*, the cocoyam taro of American origin.

The spread of cassava into the Pacific Ocean is not well known (Sauer 1993:61), but Fa'anunu has it introduced by the middle of the nineteenth century (1977:198). Van der Grijp (1993) has its introduction in Tonga at 1830, and Thaman (1985) says it was introduced into the Pacific for famine relief, presumably after the civil war (1799–1852). It has, in any case, become the major food crop in Tonga, relegating taro mostly to use for its greens. Tongan farmers recognize eight varieties of *manioke*, and it is, as it is in most places where it is grown, the last crop grown before returning a field to fallow.

Under optimal conditions, cassava can produce over thirty tons of fresh tubers per hectare per season, and when intercropped with beans, it produces as much as thirty-five tons per hectare (plus 2.9 tons of beans).² In the tropics, it can be planted at any time of the year and harvested over a long period of time, and it will produce a crop in soils too poor to grow other crops. Cassava's production of calories, at 250 kilocalories per hectare per

day (Thung and Cock 1978:7), is higher than for any other staple food crop (Toro-M. and Atlee 1980:13). It is, understandably, a popular crop among smallholder agriculturalists everywhere in the tropics. *M. esculenta* is best suited to wet and constantly hot lowland ecologies, but it has been found as far south as thirty degrees south latitude in the Americas, where it originated.

The cocoyam was also introduced in Tonga during the nineteenth century (Thaman 1976:51). It is grown entirely in dryland areas, where it can remain in the fields for many years without deteriorating. The leaves of the younger plants are favored for *lu*, greens used to wrap meats. There are five known varieties in Tonga. *Xanthosoma* is more drought and shade tolerant than *Colocasia* taro and is less susceptible to diseases as well. Thaman says that the *Xanthosoma* taro surpassed the *Colocasia* taro in importance by 1970 in many areas in the Pacific, including Tonga (1985:113). As with cassava, the ease with which the *Xanthosoma* taro can be cultivated—where the plant remains in the fields and productive for long periods and labor-intensive planting in waterlogged environments is not necessary for good production—has made the plant favored for daily consumption, but it is not a suitable crop for feasts.

The immediate impact of cocoyams and cassava on the land management of Tongan farmers is difficult to gauge. Cassava nutritionally offers little more than starch, unlike taro, which provides a host of minerals and plant proteins. But canned meat imports and the addition of horse and cattle provided desired meat in the diet and an efficient source of protein so that nutrient aspects of the crops were not influential in their adoption by Tongan farmers. My experience with farmers suggests that the ease with which cassava can be grown and the high returns the crop affords to minimal investments of labor (relative to yams, for example) have relegated yams to ceremonial food items, and they are no longer stored on allotments for long periods or eaten as daily staples. The cocoyam may have contributed to a decrease in farmer knowledge concerning *Colocasia* varieties and the characteristics of these varieties that allow their production in a wide range of environments. But the newer crops have helped increase yields per unit of land and per unit of labor in Tonga.

The introduction of these two cultivars augmented the productive capabilities of the farmer, and both cassava and cocoyams were easily incorporated into Tongan agroecology. These two crops allowed for intensification of production, where farmers could postpone returning a field to fallow and continue production on the same plot for an additional year. Cassava would still produce in weak soils and was easily cultivated and harvested (again, particularly compared to the yam). This practice clearly would contribute to soil fertility decline, but such forms of agricultural intensification were not

necessary until well into the twentieth century, within the recollection of the contemporary Tongan farmers, and the introduction of these crops initially enhanced the productive qualities of a complex cultural ecology. Tongan agroforestry remained sustainably managed probably well into the twentieth century, and, according to the oral histories of Nukunuku that I gathered, extensive changes marking Tongan commoners' introduction to the global market economy began in earnest with the arrival of American troops in the kingdom in 1939.

Some of the other crops that were introduced in the nineteenth century include guava, *kuava* (*Psidium guajava*); the soursop, '*apeli* '*initia* (*Annona muricata*); avocado, '*avoca* (*Persea americana*); and a number of other fruit trees (peach, fig, macadamia nut, cocoa, and cashew) that were rare or absent during my surveys of town and agricultural allotments. Guava is ubiquitous, and, while the plant is considered a weed, the wood is used as skewers for roasting pigs and for building temporary structures since it retains its rigidity and strength when dried. Additionally, guava is one of the few hardwood species that can successfully compete with guinea grass (*Panicum maximum*) in fallow fields. It is, in fact, the most likely dominant plant species to succeed guinea grass in a fallow left for more than five years.

A host of vegetable crops more closely associated with the European palate include corn, *koane* (*Zea mays*); tomato, *temata* (*Lycopersicon esculentum*); chili pepper, *polo fifisi* (*Capsicum frutescens*), which is found on virtually all allotments and used frequently to spice the otherwise bland Tongan diet; and cabbage, *kapisi* (*Brassica oleracea*). Additionally, papaya, *lesi* (*Carica papaya*); peanut, *pinati* (*Arachis hypogaea*); and tobacco, *tapaka Tonga* (*Nicotiana fragrans*) were also early introductions and are used by Tongan households, although tobacco is now purchased and papaya is not widely favored but sometimes fed to pigs. The introduced agricultural changes in the nineteenth century appear to have resulted in a reworking of the agricultural system in a similar way that introduced ideas of political design changed Tonga's social organization. The agroforestry system was pointed in the direction of market exchange of copra and coconut oil, but the mandated increase in coconut trees and the harvesting of an abundant and renewable resource did not alter land management or environmental resources in any significant way until the second half of the twentieth century. Until then, the system still remained oriented toward production within known limitations of the resource base, and the diversity of cultivars and the fertility of the soil was maintained until after World War II. Cocoyams and cassava added to the flexibility and resilience of agroforestry, as did pineapple, papaya, and a number of fruit trees that were easily integrated into both managed production and managed fallow. This system would persist until market production

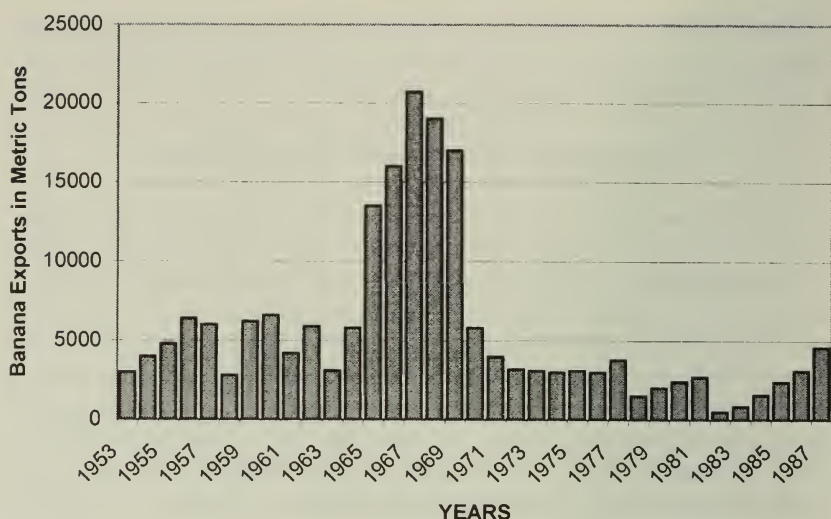
schemes based on a small number of artificially raised cultivars required expensive external inputs and extensive mechanical tillage practices, thus significantly altering land-management practices.

The Institution of Production for the Market

Banana schemes were the first truly intensive market-crop production schemes in Tonga. The production of copra from the 1830s to the present was associated with government mandates for planting a certain number of coconut trees on each allotment, with the donation of coconut oil to the church, and finally, with the plowing, from 1966 to 1972, of many allotments to ease planting of trees in rows (every ten meters). But it was the banana scheme that required intensive land preparation, plowing and disking, the application of fertilizers ("every time the rain fell," according to Paula, a village historian), the use of pesticides, and the extension of market-crop production into land usually held fallow. While some fertilizers were used for watermelon production as well, the cultivation of watermelon was not as extensive an enterprise, perhaps because bananas were a crop plant familiar to Tongan farmers.

Needs (1988) studied the banana export schemes of the 1970s and 1980s, ending his study only a year or so before the collapse of bananas as a market crop in Tonga.³ In fact, because of the resistant forms of bunchy-top virus and black leaf streak virus, bananas were scarce in Tonga during my last stay (1991–1993) and were found only sporadically at Talamahu market in Nuku'alofa. Although begun as early as the turn of the century, banana production in Tonga was a thorough boom and bust operation (see Figure 1).

Maude refers to a banana export trade from Tonga to New Zealand associated with the first shipping service between the two countries (1965, cited in Needs 1988:69). Bananas were far secondary to copra in export value. They evidently peaked around 1904 and thereafter declined as a result of diseases and the eventual consequences of World War I. Needs notes that persistent problems in shipping services and the inability of Tongan farmers to meet quotas doomed the success of banana production for the market until the Second World War. Then, production expanded to a high of 20,000 tons exported in 1967 (Needs 1988:69). The black leaf streak disease, whose resistant strains are now affecting plantains, dropped exports to 17,000 tons by 1969 (Figure 1). The boom in banana production in the mid-1960s stemmed from the Tongan Ministry of Agriculture's encouragement (*ibid.*: 13). The production could only be maintained, however, with continued application of external inputs in fertilizers and pesticides. In the 1970s New Zealand sought to increase its involvement in Tongan banana production



beyond the simple quota system that gave Tongan banana producers preferred access to the New Zealand market. Falling production in Tonga resulted in New Zealand's importation of bananas from Ecuador and the Philippines, and the 1971 Banana Export Scheme was initiated, where the smallest permissible acreage in banana production was two acres, effectively squeezing the small producer from competition.

Needs reports that there were forty-nine registered growers in the Nukunuku area (1988:71). The small growers recognized that a few banana producers controlled a disproportionately large proportion of land in banana cultivation. Needs refers to these as the bourgeoisie (*ibid.*:73), since these farmers had significant economic interests in a number of ventures and were able to secure larger landholdings by special arrangements with nobles. The small producers were required to change their allocation of scarce resources to maintain banana production and were, therefore, increasingly faced with disproportionate costs in their productive activities. The gale of February 1989 demonstrated the risks involved in capital and labor investments in this particular market crop. The significance of banana-crop production in Nukunuku was presented to me by three village historians, who confirmed its role in the changing political ecology of Tongatapu. The production of bananas for the New Zealand market required, for the first time in three millennia of Tongan agriculture, external inputs in the form of fertilizer, pesticides, and extensive mechanical tillage. One of the village historians recognized the

possible effects of population pressure on limited land area, but he presented details on the decline in soil fertility since the 1970s in Tonga, which he attributed to banana production. The following discussion broaches a number of subjects regarding the changing human-land relations that characterize the increasing involvement of Tongan farmers with production for export.⁴

Interviewer: When did people first recognize the soil fertility was declining?

Paula: Starting in the seventies.

Interviewer: Did all the farmers recognize it? How did they know?

Paula: Their crops no longer grew big and healthy in that soil. [So] chemical fertilizers are used to make crops grow big.

Interviewer: So, when they recognized the soil energy was declining. . . .

Paula: Soil energy. They start using plowing at their first planting, especially eastern farmers, for they usually grow peanuts and kumara. Also they use plowing because of the desertlike soils. They continue doing the same way, plowing, but still the soil stayed the same. Therefore they started using chemical fertilizers.

Interviewer: So, that started in the seventies?

Paula: Yes.

Interviewer: Did the farmers do other things in order for the soil to regain its fertility naturally or only use chemical fertilizer?

Paula: It's only the elders' method. They leave the soil in fallow [and] also use bush beans to grow in that piece of soil.

Interviewer: So, the farmer knows the decline in soil energy by recognizing that the crops no longer grow big and grow healthy, and produce fewer fruits?

Paula: Yes. They know when they see the crops didn't grow big, like taro, they didn't grow big, also cassava produce few fruits. But by the use of chemical fertilizer crops start to grow big and produce much fruit. If they stop using chemicals, it goes back to the same thing, so the only thing is to leave the soil in fallow for four years or five years.

Interviewer: What are some of the factors that cause the decline in the soil energy?

Paula: Mainly because of too much growing of banana and coconuts. Because banana and coconuts are the main sources of income for the people in Tonga. They start using fertilizers for the bananas, only with coconuts are fertilizers not used, to start from the forties up to now. If fertilizer is also applied to coconuts, it will produce much fruit and big ones. But for bananas, chemical fertilizers were used. Chemical fertilizers were divided up into every home, including myself. Every home had about ten to twenty sacks of fertilizers. And when rain fell, people applied fertilizer to the banana trees. But now, fertilizers are used for every crop.

Interviewer: How do they try to make soil more productive? Only by using chemical fertilizers and leaving the bush fallow?

Paula: Use fertilizers when the crops grow. If still infertile, then leave with bushes for four or five years.

Interviewer: Even plowing?

Paula: Leave with bushes four or five years. Now in Tonga, people usually use plowing for every crop like in the yam plantation. If people want to grow yams, they first plow the area, then dig the soil. Now it seems that without plowing the soil and crops will be bad, because the soil is not good.

Interviewer: When did people first grow bananas?

Paula: People started growing bananas when I was still a kid.

Interviewer: So in the forties!

Paula: No, in the forties I was a young man, for in forty-five I left the army. In 1933 I was ten years old. At that time bananas had been grown by people. That time, it was two shillings for a box of one hundred and fifty pounds.

Interviewer: So in approximately 1930 bananas were present here?

Paula: Yes, before 1930 up until now.

Interviewer: Did everyone in the village join in growing bananas?

Paula: Every man was free to do it [if he wanted to]. If a man wanted money for his family's needs, he grew bananas. However, there were some people who were too lazy to grow bananas, so they became poor, lacking clothes and food.

Interviewer: So bananas were Tonga's first export goods?

Paula: No, coconuts before 1930. First coconuts, then bananas.

Interviewer: So people of Tonga changed from growing yam plantations, their native plantation, to growing banana plantations in one acre.

Paula: Only some people grew bananas, for everyone was free to grow what he wanted. But only if a man wanted a lot of money he may grow many bananas. If he already had a lot of money, he may only have five to ten boxes.

Interviewer: Did people cut down the native trees of their allotment in order to grow bananas?

Paula: Oh yes! They did cut down the trees and cleared it off for banana plantation.

Interviewer: So they cut down the trees and also used chemical fertilizers?

Paula: Yes.

Interviewer: When were chemical fertilizers introduced to Tonga?

Paula: Chemical fertilizers were brought after the fifties. That's when the war finished in 1945. At the same time the population increased and goods were expensive. Like canned beef, it was fifteen cents, but today it is three or four dollars.

Interviewer: When did farmers start using insecticides?

Paula: It was the Ministry of Agriculture who first used it. That was in the 1940s when people grew melons. A lot of harmful insects attacked the melon, compared to the past when watermelons were grown and nothing happened and they bore a lot of fruit. I remember when I was a kid, Fisihopo grew a big melon plantation. The only thing he did was catch the flies flying around, but when the little watermelon has three or four leaves then nothing is done to it, no chemical fertilizers applied. In 1945 to 1950, if chemical fertilizers weren't applied, nothing would come from that watermelon, because lots of diseases were coming to Tonga during that time. Still people don't know what brings those diseases to Tonga. In the past, if we ate melons and threw the seeds anywhere, it would grow exactly in that area.

Interviewer: When people started growing bananas, did they also change their way of leaving their allotments fallow?

Paula: Yes, because people wanted money, they started using

other methods like plowing instead of leaving the land fallow. They plow and plow their allotments, at the same time using chemical fertilizers. Like what happened to the squash growers in the eastern districts, they have very bad production from their squash because of too much plowing; not like the western squash growers, they have good products.

Interviewer: Who grew bananas in Nukunuku in the thirties?

Paula: Almost everyone here had banana plantation in 1950. In 1960 every home had a banana plantation except only ten homes who didn't grow bananas. That includes 'Ikaihingo's home, for they are lazy, only eating bananas from other people.⁵ We can tell those people by seeing their living standards now. They have bad homes, bad clothes, and bad food, for they just rely on coconuts and don't grow bananas.

Paula's recounting of agricultural market production in Tonga reviews the significant developments: (1) copra, encouraged by Tauafa'ahau Tupou I's donations of coconut oil to the church, was the mainstay of Tongan exports until the boom years of the banana scheme; (2) watermelon growing coincided with the production of bananas for the market; and (3) bananas, until the advent of squash production for the Japanese market in 1987, led Tonga's agricultural market production into the late 1980s.

The ecological consequences of the banana scheme are hinted at when Paula notes the changing land-management activities of the farmers and the increased chopping down of hardwood trees to make room for the banana plantations. The introduction of chemical fertilizers, if used as the only means of maintaining soil fertility, destroys natural fertility and limits the organic content of the soil. This process leads invariably to dependence on chemical fertilizers to maintain productivity. Similarly, the use of pesticides disrupts natural balances between predator and prey insect species, increases the resistance of pests to chemical management, and fosters the increased dependency of farmers on external inputs.

Another elderly informant, Poupou, told of the denuding of the landscape by privately owned timber operations who arrived with the banana scheme to produce the shooks for shipping the bananas (see Shankman, this volume, for discussion of deforestation in Samoa). As Clarke and Thaman note, "In Tonga, during the height of the banana boom, so many trees were cut to provide shooks for banana boxes and to extend banana plantings, that saw-millers had to move from Tongatapu to the near-by island of 'Eua" (1993:

13). So, while the Tongan statistics show the financial returns from the now-bust banana production of the 1950s to the 1980s, these statistics do not include the environmental costs of one of the final stages of deforestation on Tongatapu. Tonga did not send only its soil fertility to New Zealand (and now to Japan), it sent much of the last of its old-growth trees as well, in the form of banana shooks. Because these sawmill operations were privately financed ventures, there are no government records of this stage of deforestation on Tongatapu. Poupou had a clear recollection, though, of the deforestation that accompanied the banana scheme.⁶

Poupou: This bush allotment was covered by *kotone* trees. All *kotone* from this area to that area.

Interviewer: So that's the native tree here?

Poupou: Yes, *kotone* is the tree here, but these other trees here have just been grown. But the *kotone* are very stout, you can't reach your hand around them. But later a woodcutter named Waters cut them down for banana boxes. He paid T\$2.00 per tree, and a big truck came and took six or seven trees away [at a time].

Interviewer: Did you choose some of the trees to grow here like *'ifi* and those trees?

Poupou: *'Ifi* doesn't grow here, also breadfruit. I grow it, but it doesn't grow healthy because of the sea spray. These are the only trees of this coast, the *kotone*.

Kotone trees (*Myristica hypargyrea*) were known for providing strong and flexible boxes for shipping bananas (Thaman 1976:413), and most of these trees on the southern side of the island have long since disappeared. Their utility, known by indigenous farmers, came because they were salt tolerant and, therefore, shielded the tuber crops from the damaging effects of the salt spray. Since the harvesting of *kotone* for banana shooks, the agricultural productivity of the southern side of the island has diminished considerably. In terms of long-term management of agricultural resources, the preservation of *kotone* trees would have been far more economically significant than was their use as banana shooks for the short-term benefits of the banana scheme. In a sense, *kotone* trees were shipped to New Zealand in attempts for a favored balance of trade. The hidden costs of this scheme were the loss of many old stands of trees, the loss of tree biodiversity on Tongatapu, and the loss of agricultural productivity on those parts of Tongatapu affected by salt spray.

The government insists that banana production for the market has only

TABLE 2. **Banana Production and Export, 1985–1989**

	1985	1986	1987	1988	1989
No. of growers	324	244	224	153	143
Total acreage	1,711	1,139	1,103	709	656
Export tonnage	2,682	3,568	3,484	1,486	343

Source: Ministry of Agriculture, Fisheries and Forests 1991:120.

been temporarily suspended owing to the discovery of black leaf streak and fruit fly infestations, but the farmers I spoke with all agreed that banana production for the market was dead in Tonga. In terms of calculated returns to inputs, export banana production had the lowest returns of all crops in Tonga, returning T\$2.25 per hour of labor input and T\$1.45 per T\$1.00 input of variable input costs (Delforce 1988:101, 103), a fact no doubt well realized by Tongan smallholders. Despite a number of technical bulletins on banana production and export banana production (Ministry of Agriculture, Fisheries and Forests 1982, 1988), farm management handbooks (Gyles, Sefanaia, Fleming, and Hardaker 1988), pesticide recommendations (Kingdom of Tonga 1984), and other government incentives, the evidence indicates that banana production may never again materialize. Table 2 shows the rapid decline in export banana production from 1985 to 1989. The number of farmers involved in production and, therefore, the number of acres in production show a general decline, but the most telling piece of information seems to be the decline in production per acre from the high of 3.1 metric tons per acre in 1986–1987, to 2.01 in 1988, and an abysmal 0.5 tons per acre in 1989.

A graphic representation of the boom and bust of banana export production is represented by the histogram in Figure 1, showing production in metric tons of export bananas from 1953 until 1987. The decline from around 17,000 metric tons exported in 1969, the last of five years of production boom, to around 6,000 tons in 1970, an amount never again to be reached, presents a rather ominous picture of boom and bust production schemes. The culprit in this instance was a resistant strain of black leaf streak virus and the insect vector of this virus, the fruit fly (*ngutu*), first recognized in 1968 (‘Amanaki 1974:11). The black leaf streak virus, along with bunchy-top virus, is now infecting plantains that are normally resistant to these two viral infections (Halavatau, pers. com., 1993). When I left Tonga in 1993, bananas were increasingly scarce at Talamahu market, and they are now rarely available in the local markets. A similar spread of mosaic virus and powdery mildew may be associated with extensive squash production.

Economic Growth and Agricultural Intensification on Tongatapu

In addition to growing for export, farmers in Nukunuku began growing traditional crops for Tonga's urban market by taking land out of fallow early or planting an additional crop of cassava before returning a plot to fallow. The influx of migrants to Tongatapu for educational and employment opportunities near the capital created demand for food crops produced by the farmers in the Nuku'alofa area. Pressure to produce for the market encouraged local farmers to shorten fallow periods, but productive yields were not noticed by farmers until the 1960s or 1970s. Farmers now complain of rapidly decreasing soil fertility, an inability to return land to fallow, and increased reliance on fertilizers.

Some analyses of Tongan agriculture for the Vava'u group, which had experienced significant out-migration, suggested as late as 1983 that agricultural production by traditional means could be intensified further without real threat to soil fertility (Schroder et al. 1983). Since that report, soil erosion on Vava'u has become a problem (Halavatau, pers. com., 1993), suggesting that changes in traditional forms of land management, such as limited tillage, that guarded against soil erosion have happened only recently, but the changes came rapidly. Tractor plowing reduces farmers' labor investments tremendously and is required for squash production. Under a regime of reduced periods of fallow, tractor tillage facilitates the intrusion of guinea grass into fallow areas, prohibits regeneration of deciduous woody plants by disturbing root systems and killing seedlings, and contributes to rapid soil leaching and erosion (Halavatau 1992; James 1993). Van Wambeke reports findings of soil scientists in tropical ecosystems that convincingly demonstrate that grass fallow returns less soil organic matter and regenerates soil fertility at a significantly lower rate than do fallow systems of deciduous plants and secondary forest growth (1992:88).

The coconut replanting scheme initiated in Taufa'ahau Tupou IV's (the current Tongan monarch) first five-year development plan in 1966 resulted in the linear planting of coconut trees now seen throughout most of Tongatapu. The planting of trees in this manner required plowing portions of a great number of agricultural allotments in Tongatapu and represents the first such extensive plowing of land in Tonga. It resulted in the planting of some 40,000 trees between 1966 and 1981 (Kunzel 1989:1). Tongan farmers, for the most part, were immediately impressed that a tractor could do in a few hours what it would take a smallholder household weeks to accomplish. Taufa'ahau's coconut planting scheme, an otherwise positive change in production, opened the door to farmers' use of tractors, the continuing use of which will have adverse effects on soil fertility (see also Kunzel 1989). A

village historian, Paula, noted that early market banana production did not include plowing, and several farmers, including Poupou (who still refuses to plow his land), recalled plowing on allotments happened first with the government coconut planting project in 1966.

In the Kingdom of Tonga's Sixth Development Plan (1991–1995), the ultimate aim of the government was to “induce improvements in the standard of living of Tongans in an equitable manner, with a view to protecting natural resources and preserving cultural assets.” This goal requires private-sector development to “serve as the main engine of economic growth” (Ministry of Agriculture, Fisheries and Forests 1991:i). Recalling the “symbiosis” between Tongans and the natural environment as the source of Tongan *fiemalie* (feeling contented and relaxed), the plan calls for improving the management of natural resources in order to “attain optimal levels of exploitation, and allow sustainable development” and, while safeguarding these resources, to “enhance the contribution of natural resources to economic and social progress” (ibid.:75). In agriculture, the Sixth Development Plan had the long-term objectives of generating adequate local income for the rural population, allowing agribusiness profitability, securing a steady food supply in the kingdom, and ensuring that “the natural resources and the environment that relate to agriculture will not be harmed by farming activities” (ibid.:117). The short-term goals were to allow for “accelerated growth in private agricultural production” and to diversify export markets for agriculture.

Some crops exported from Tonga in small amounts (less than ten tons) include pineapple, breadfruit, sugarcane, and kava, and government efforts are presumably oriented toward encouraging market-crop diversity. Copra has remained somewhat constant in its contribution to the export economy of the kingdom, although the effects of Hurricane Isaac in 1982 are clear in the drop in exports for 1983 and 1984. Cassava, taro, and other root crops are becoming increasingly attractive market crops for local farmers. The benefits of cassava as an export crop, in the form of peeled and frozen tubers meant for human consumption, rather than dried cattle feed, is an excellent alternative market crop for the farmers in Nukunuku, because refrigerated freight containers can be brought to the village, and, in a matter of a week, a half-dozen smallholder households can contribute enough cassava for a quick cash return (around T\$1,000.00) without a great deal of effort. The crops, in this case, are sent to Polynesians residing in Auckland, and the farmers appreciate that the sales are negotiated with other Tongans and that the produce contributes to a form of maintaining *angafakatonga*, the Tongan way, among Tongan expatriates in New Zealand. The Tongan connection in this way may, along with remittances, contribute to a more stable though limited

export market, and tuber production does not yet require adding chemical fertilizers to ensure marketable returns.

It is easy for farmers to plant a little extra cassava in case a need for extra and quick cash were to arise. One farmer, who had marketed watermelons and squash in the past, planted an area 17 by 55 meters (935 square meters) in cassava for family consumption and possible market sales. Requiring extra cash to make an acceptable donation to a relative's wedding, this farmer harvested 512 plants and marketed 1,250 kilograms (fifty 25-kilogram sacks of peeled cassava), for which he received T\$750.00, or T\$15.00 per 25-kilogram sack. In the process, he gave sixty kilograms (or so) to the young men who helped him prepare the crop for export, and another fifty (or so) kilograms were thought unfit for export and were taken to be given to pigs or tossed aside in the bush.

The same field was replanted in cassava using the stalks from the recently harvested plants as planting material. The remainder of the original cassava crop (450 plants, or about 1,100 kilograms) was consumed in the household over the next four or five months, during which time that area returned to fallow as the second planting was beginning to be ready to harvest. The entire plot was slowly returned to fallow as the second planting was harvested as needed. Cash cropping cassava in this way fits nicely into existing crop management and does not require any imported inputs or changes in technology to produce reasonable returns on an ad hoc basis. One farmer and worker for the government's Central Planning Division suggested that two market-cropping strategies were developing in Tonga; one was the growing of cassava for occasional, as-needed sales and vanilla for a once-per-annum substantial sale, and the other was the once-per-year sale of as much squash as one could possibly produce.

Growing vanilla as a cash crop seemed to be gaining some popularity with farmers in Nukunuku, since significant returns are realized after two or three years invested in putting the crop in and letting it develop sufficiently to bear a marketable crop. The crop also requires labor-intensive pollination of flowers to ensure production, but it can be grown in a relatively small area, and it requires few external inputs once established. In 1989, 25,057 kilograms of vanilla were exported to the United States. The area under vanilla production, around 400 acres across the kingdom, has not increased appreciably in those five years.

The introduction of squash for the Japanese market in 1987 became the latest and the most damaging of the export schemes in Tonga's development in the international marketplace. The impact of the squash market on Tongan agriculture may well have been the most significant disruption of the environment on Tongatapu since the initial colonization of the islands. The effects

of the mosaic virus, which favors cucurbits generally, had curtailed the cultivation of squash in Mexico. Tonga's favorable climate presented a window of opportunity to grow squash (up to 18,566 tons in 1991) in the period between the season in California, which ends in October, and the season in New Zealand, which begins in December (*Tonga Chronicle* 45, no. 3 [November 1991]: 27). The crop provides a very fast return on investments of labor and capital, and so has become a highly favored way for many farmers to gain easy money just before the church offering (*misinale*) and the Christmas feasting season. Plans have been formulated to extend squash production to Ha'apai, and the number of growers in Vava'u and on 'Eua has been increased (Fonua 1992:11).

Squash production for the Japanese market began in 1987, when a New Zealand marketing firm came to Tonga to organize production for the time period between seasons elsewhere for growing these squash (Delica variety of *Cucurbita maxima*). The crop gained immediate popularity, in part because of the T\$0.50 per kilogram price that the squash fetched for farmers, but also because the financial returns on recommended investments of ground preparation, chemical fertilizers, pesticides, and fungicides of T\$650.00 per acre were significant, with an expected minimum yield of three tons per acre and average yields around seven or eight tons per acre.⁷ News reports of extraordinary yields, such as those by a Kolovai farmer who produced 18.8 tons, harvested, selected, and sold for a return of T\$8,160.00 from 1.3 acres of squash (*Tonga Chronicle* 6, no. 7 [February 1991]: 7), fueled farmer interest.

In arranging loans for squash production through the Tonga Development Bank, government involvement in negotiations among four export companies in 1991 secured 6,000 tons of an allotted 10,000-ton production limit to an agency called Tonga Multipurpose Cooperative, the managing director of which was Prince Maliefihi Tuku'aho. The remainder of the allotted production was divided up among the other export companies, who were displeased with their allocations and decided to extend their production limits and negotiate their own shipping and marketing arrangements. Growers' fears of flooding the market were alleviated by government announcements that, it was alleged, led producers to believe that the market could take 30,000 tons (Fonua 1992:21). The government's enthusiasm for squash production was clear and reflected in the minister of finance's proclamation that "if we could grow 100,000 acres, it would bring in about T\$300 million. That would end the trade deficit" (*Tonga Chronicle* 45, no. 3 [November 1991]: 7).

The number of growers increased from 40 in 1987 to 392 in 1991 and 1,300 in 1993, with the number of acres in squash cultivation increasing from 200 acres in 1987 to 1,617 acres in 1990 and 3,000 acres in 1993 (Tonga Develop-

ment Bank 1991:3; Fonua 1992:11). The organization of production and marketing through one, then four, then twenty-one exporting companies by 1992 resulted in logistical and transport problems that oversupplied the Japanese market with poor-quality fruit, much to the displeasure of the Japanese business interests in the scheme. Additionally, miscommunication created freight delays, and fruit rotted in shipping warehouses in Tonga and on board freighters on their way to Japan. As of November 1991, over 20,000 tons of Tongan squash had arrived in Japan when 8,000 tons were expected, creating alarm among buyers but elation among growers, who had been given assurances of favorable returns on their production (as much as \$T0.56 per kilogram). Exporters withheld payment to growers after dead freight charges, poor-quality crops, and optimistic forecasting led to a significant but temporary decline in the crop's profitability.

By the end of the 1993 season, several voices of concern were being heard about the damage squash production was doing to the environment (James 1993; Fonua 1994). Workers at the government's Ministry of Agriculture complained that farmers were not following their directives and were either overfertilizing the land in hopes of increasing production or underfertilizing in order to save on input costs. Overfertilizing can change the timing of flowering of male and female flowers on the squash plant, and productive yields usually decline. In the case of underfertilization, first-year yields are adequate, but subsequent yields drastically decline and soil fertility is heavily affected. In the process of applying fertilizers to maintain yields, spraying pesticides to prevent aphid infestation and the spread of viral diseases, and applying fungicides to prevent powdery mildew, Tongan farmers were using 150 tons of fertilizers and 25 tons of pesticides every growing season (Fonua 1994). The head of the research division of the Ministry of Agriculture stated in 1994 that the squash industry in Tonga had reached the crisis stage and might enter a disaster stage if controls in production were not initiated. The last, unconfirmed report that I received about growing squash was that increased production had again occurred in 1994, with growers now in all major island groups and that, on Tongatapu, so many piles of unmarketable squash were rotting in the fields that a severe infestation of houseflies had followed, requiring the importation of insecticides to kill them.

While crop production for export has been the mainstay of Tongan economics, supplying around 27 percent of its GDP (Sturton 1992:8), there is concern that the agricultural techniques required for producing a profitable crop cannot be long maintained. The greatest concern is with the consequences of extensive harrowing and plowing of Tongan soils. Halavatua (1991, 1992) has evidence that a decrease in water-stable aggregates and loss of organic matter in the soil result from frequent plowing and harrowing. The

rich Tongan soils are left exposed during squash production for periods as high as three months, if Ministry of Agriculture guidelines for early land preparation are followed, resulting in severe leaching of minerals and the possibility of a hardpan formation between the topsoil and clay layers. Such a hardpan could prevent effective draining of the soil following rain and could lead to waterlogging of some soils (Furness, pers. com., 1992). Additionally, the application of fertilizers and pesticides required first for bananas and watermelon and essential now for squash production could damage the freshwater horizon from which municipal water is now drawn. Although there is no evidence that the groundwater is contaminated (James 1993), continued use of these chemicals in the quantity needed for successful squash production could lead to severe groundwater contamination. With government support for any manner of improving the balance of foreign trade, the continued importation and use of chemical and mechanical land-management techniques is likely to continue as long as farmers' returns are kept high.

Conclusion

The historical ecology of the village of Nukunuku and the agricultural lands that surround it demonstrates the increasing simplification of Tongan agroforestry. Beginning with decreasing fallow periods to meet the needs of an increasing population and continuing with the adoption of monocropping and industrial agricultural techniques for the market, the trend in Tongan agriculture is increasingly in the direction of increased dependence on industrial inputs and possible entrapment in the pesticide treadmill (Gleissman 1998:5; Altieri 1997). The agricultural techniques now being adopted in Tonga enhance the ability of smallholders to meet family and social obligations, but the cost of adopting capital-intensive methods may be the long-term sustainability of Tongan agroforestry (Halavatau 1992; Clarke and Thaman 1993; Stevens 1996).

Since squash production is a relatively recent introduction in Tonga and the returns on farmer investments are fast and often significant,⁸ it appears to present a solution to Tonga's trade deficit and to farmers' desires for improved standards of living. The evidence on squash production in the Nukunuku area indicates that farmers have taken fields out of fallow, sometimes long-term fallow, to grow squash. Because of this fact and because of the added inputs of fertilizers and urea to already rich soils, the initial years of production have been impressive. The Tonga Development Bank expected squash yields of four metric tons per acre in Tonga, and their loans to farmers were based, in part, on that expected yield. The returns have been substantially higher, contributing to the flood of Tongan squash on the Japanese

market. One farmer had gross returns of T\$24,600.00 on his second squash crop. Farmers were paid about T\$0.56 per kilo of squash in 1992, meaning that this farmer produced almost forty-five metric tons on eight acres, an average yield of 5.6 tons per acre.

Farmers were clearly impressed with the production and with the short time, about four months from plowing to harvesting, that was required for significant monetary returns. Some farmers in my research were concerned about using the necessary chemicals to ensure productive squash yields. Other farmers felt that plowing was inherently damaging to the soil and chose to sell cassava or vanilla in the market. The initial success of squash production influenced the farmers' perspectives, and few appeared aware that yields may never be as high as those associated with the first three or four years of production, when the effects of plowing were not yet apparent and dependency on fertilizers not fully established.

Halavatau (1991, 1992) and Halavatau, Manu, and Pole (1992) provide data on the consequences of agricultural production on the soils in Tonga-tapu. Halavatau's greatest concerns are the loss of organic matter and the decrease of water-stable aggregates in the soil. Halavatau, Manu, and Pole state, "The major threat to the Tongan agricultural systems is the breaking of the nutrient cycling system by cutting of forests and loss of nutrients as a result of logging, increased frequencies of shortened fallow period, or permanent cultivation (1992:108)." The history of ecological change in Tonga is one of continued environmental degradation. The inclusion of Tongan smallholders in a global economy has provided farmers with opportunities for access to cash that enhances their ability to meet family and household obligations, which, to the exclusion of concerns for the ecology, is what Tongans are most interested in sustaining. How long Tonga can continue to base its export agriculture on industrial forms of agriculture remains to be seen, but the evidence suggests that the present course of action will result in the continued loss of biological diversity and, in all likelihood, soil fertility and the eventual degradation of the mainstay of Tonga's economic capabilities, its agricultural resources.

Land preparation for squash and reliance on plowing in subsistence-crop production are regarded by some farmers as damaging the soil. While distinctively Tongan relations of production and the maintenance of obligations between families and among households may be well sustained by these trends, Tongan agroforestry may be becoming increasingly unsustainable. Sustaining social relations of production could lead to the loss of sustainable human-land relations. One of the most philosophical statements made by a farmer came from Poupou, the old farmer who refused to plow his fields and who could grow taro in a drought: " 'Oku tau teka atu fohi 'o hange 'oku

tau fiepoto'i 'ae me'a 'a e 'Otua. Ko ko poto 'o e tangata ko e vale ka koe poto ia 'o mamani ka koe vale pe ki he 'Otua." (We sometimes take over what belongs to God. We felt smart in these things, [but] to God men seem stupid about the world.)

NOTES

Funding for research on the political ecology of Tongan smallholder agriculturists was provided by the Wenner-Gren Foundation for Anthropological Research.

1. See Sauer 1993 on the origin of the sweet potato in tropical Central America.
2. The land equivalent ratio, the amount of a crop grown in intercropping compared to the amount of the same crop grown as a monocrop, is consistently higher than 1.0 for cassava, and land equivalent ratios of 1.5 are feasible (Thung and Cock 1978:16). In smallholder production, cassava is almost always intercropped and multicropped with maize, pigeon peas, plantains, and sugarcane.
3. While I was in Tonga, a gale hit Tongatapu at the end of February 1989, a month that set the record for rainfall at 726 millimeters. The storm came as a surprise, because it had been forecast to miss the islands but, instead, raked down the entire island chain. Although *merely* a gale, the banana crop, which would have been ready for harvest but one month later, was destroyed. The storm brought down power lines and uprooted trees from waterlogged soil. It damaged other crops as well, but the subsistence crops survived, the banana scheme did not.
4. This interview was held on 28 November 1992, with 'Aisea 'Eukaliti and Stevens asking the questions.
5. The name 'Ikaihingoa is a pseudonym.
6. Poupou was interviewed on two occasions. I was told of Poupou's expertise in farming at a *faikava* in Nukunuku by a young man from the same village as Poupou. During a period of drought, Poupou was selling ninety bundles of *lu* (taro leaves) in Talamahu market every week when the lack of rain had made taro leaves very rare. Poupou refused to plow his allotment and used old techniques to ensure productive taro when other farmers had no taro at all. Poupou was ninety-one years old and still working in his allotment six days per week when 'Aisea 'Eukaliti and I talked with him at his bush allotment.
7. Smallholders who grew squash on from less than one to no more than two acres obtained an average yield of 3.4 marketable tons per acre, while farmers growing on larger plots received increasingly lower yields per acre but larger gross yields (Tonga Development Bank 1991:3). In the last few years, these yields have increased to eight tons per acre (Fonua 1992:13).
8. Some farmers had poor experiences growing squash and, after an initial attempt, have decided not to pursue further squash production. Toetu'u, one such farmer, now grows tubers, principally cassava, for the market.

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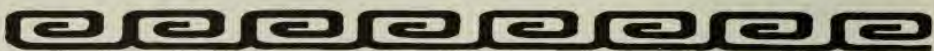
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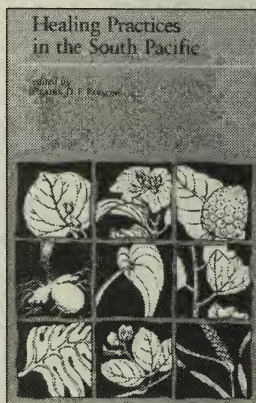
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1st paperback edition, 1995. 227 pp. \$19.00. Published by The Institute for Polynesian Studies, Brigham Young University-Hawai'i. Distributed by University of Hawai'i Press. ISBN 0-939154-56-0



0275-3596(199909/12)22:3/4;1-V

